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BY

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WITH A DESCRIPTION OF THEIR

PATENT
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AND THE

Opinions of the Public Preſs on its Merits.

LONDON;
W. J. ADAMS, 59, FLEET STREET.

1847.

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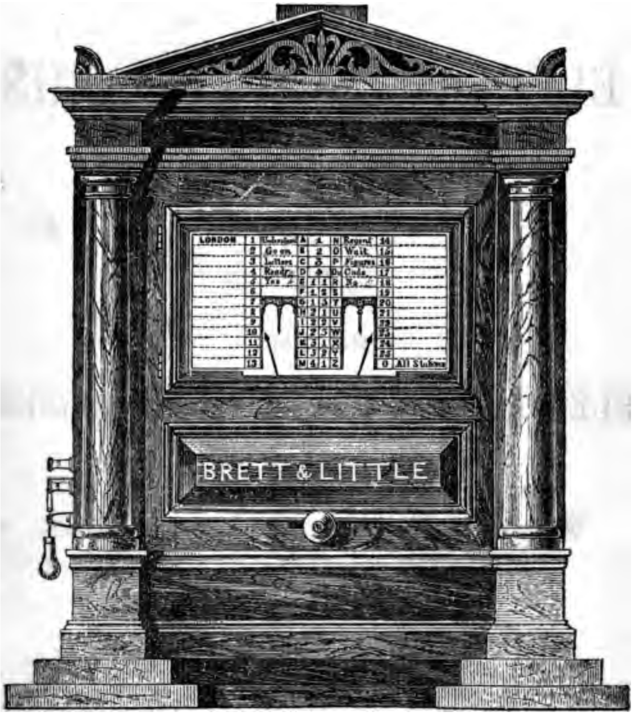

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COMPENDIUM

OF

BRETT AND LITTLE'S

ELECTRIC TELEGRAPH.

INTRODUCTION.

Among the numerous discoveries and inventions which have marked the present age, although many have taken place of considerable national importance, there are, perhaps, none which in their results will have so revolutionised society, and have effected such extraordinary changes in the track of civilization; in the condition, social, moral, and political, of the people, as the establishment of the Railway System, and the discoveries of the properties and powers of galvanic electricity as applied to telegraphic purposes. The latter, indeed, is to the former what mind is to matter; for never could the full powers and capabilities of railway transit have been properly known or appreciated, without some telegraphic agent, by which instantaneous communication could be effected from station to station, or even from terminus to terminus, in case of accident, or other circumstance requiring the instant transmission of important intelligence. The only agent science has yet discovered to the human mind, by which this desirable end could have been obtained, is galvanic electricity, and already are its gossamer paths stretched for some hundreds of miles on our railways, along which the subtle fluid pursues its rapid and unwearied course, giving instant token to distant stations of the times of starting and arrival of trains, interchanging the results of monetary and commercial intercourse between the metropolis and all the great marts of trade, shipping, and manufactures, and conveying every intelligence to the most remote parts of the kingdom in less time than it takes to write a sentence. With an agent at command from which such wondrous results take place, it is at once evident that the means employed for its transmission should be of the most perfect kind that can possibly be obtained, that above all, complexity of arrangement should be avoided; and it will be the object of these remarks to show that the apparatus employed for the MAGNETIC NEEDLE TELEGRAPH now in use, is complex in its formation, difficult in its operations, continually liable to dis-arrangement, costly in its construction, and uncertain in its use: and that the principles of the electric telegraph of Messrs. BRETT and LITTLE are based on simplicity, facility in working, little chance of accident, and great economy. No human inventions are complete at first; and while the palm of merit is most deservedly due to those pioneers in science whose mental and physical exertions first introduce to public notice, public use, and public benefit, any new discovery, it does not follow that we are to be bound to the crude and imperfect means by which certain results are in the first instance obtained; but the arena is then open, and it is for the national benefit, that the inventive genius of man should be cherished and encouraged, through which alone has emanated all the great mechanical improvements for which this country stands so proudly pre-eminent: always, however, is it the case that in the introduction of any new invention, numerous difficulties and obstacles to their advancement have to be overcome; the clashing of individual interests, settled connections, existing prejudices, and the influence of powerful companies, have to be contended with; and yet, in spite of all these, if a discovery is based on sound principles, and carried out with spirit and perseverance, it will ride out the gale of opposition, and enter the harbour of success in triumph. The patentees of the ELECTRIC TELEGRAPH under notice, have, however, little to fear; not mere theorists in electric science, they have, after well examining the principles of the NEEDLE TELEGRAPH, made themselves masters of all its defects; defects, alas! too well publicly known to need comment here; have applied in many cases the most successful remedies, and have in the aggregate produced an apparatus which may constantly be depended upon, simple in construction, facile in operation, and most economical as to cost. It is now open for the inspection of the scientific public, and the proprietors confidently leave it to stand or fall on its own merits. Patents have been secured for all Europe and America; and as it is the anxious desire of the patentees to see the full developement of the principle carried out, and its vast superiority over others proved, they are prepared to allow its use by Railway Companies on the most *liberal terms;* not restricting its application merely to RAILWAY PURPOSES, but leaving them free to employ the TELEGRAPH in whatever manner and under any circumstances which the directors may think conducive to the company's interest. The patentees prefer, in the first place, granting licences for their ELECTRO-TELEGRAPHIC CONVERSER, giving the licensees the option of employing their own workmen, or contracting with any parties they please, to affix the wires, posts, &c., only reserving to themselves the right of supplying batteries, instruments, bells, insulators, and every part of the patent apparatus. The payment to be made at a certain sum per mile, per wire, per annum; or, by one payment of a certain sum per mile, the parties licensed will have the right of using the *principle* during the whole period for which the patents are granted, without restriction as to the number of wires. Railway Companies who have already adopted any other TELEGRAPH, and having become convinced of the superiority of BRETT and LITTLE'S, feeling disposed to substitute it, need not consider the expense as an objection, as it will in most cases be found that a great saving has been effected by the alteration.

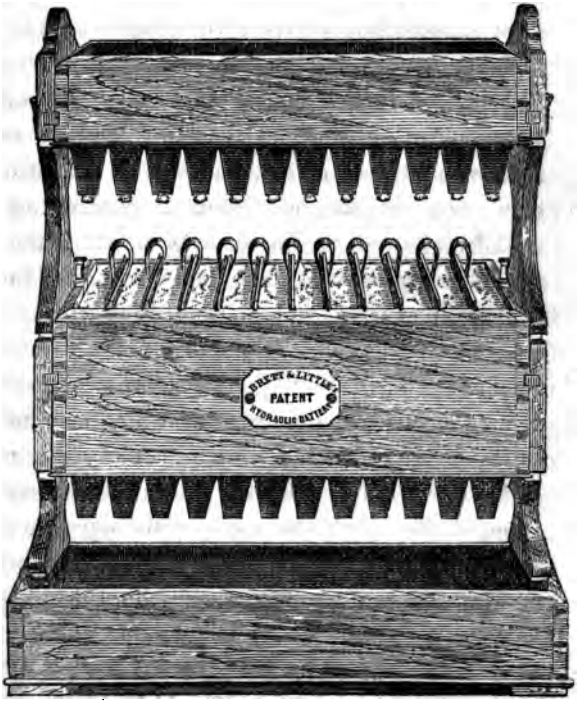
It is intended in these pages, in the first place to give a plain and popular description of the entire details of the apparatus employed; next to show its superiority over the NEEDLE TELEGRAPH, by a comparative analysis of every working point, plainly exhibiting the failings of the latter, with Messrs. BRETT and LITTLE's improvements; and finally to close with complete copies of all the articles which have appeared in the London newspapers and scientific publications, which being expressive of the unbiassed opinions of their several editors, after the most critical inspection, afford ample guarantee for their impartiality. In the construction of the IMPROVED TELEGRAPH, the patentees are convinced in their own minds that they have obviated many imperfections and surmounted numerous difficulties; while they invite the most searching investigation into the merits of their system; and are prepared to give the most candid and efficient explanation as to its details.

DESCRIPTION.

THE BATTERY.

Most of our readers are aware of the nature of electro-galvanic action, and how it is artificially produced, but as this treatise may fall into the hands of the uninitiated, we subjoin a brief account. Whenever two metals are brought in contact, and in connection with an acid, chemical decomposition takes place, which destroys one of the metals; this action produces galvanic electricity, a current of which may be carried to any distance instantaneously by a conductor of iron or copper; this is the natural action, which is continually in operation throughout every portion of the globe. To obtain all the benefits to be derived from the electric current, it is necessary to keep up a *uniform* power in the battery, whatever the extent of that power may be; this has, hitherto, been most difficult, if not wholly impossible to accomplish, from the continual formation of the sulphate of zinc on the surfaces of that metal; such sulphate, as it forms, continually diminishing the power, besides being troublesome and difficult to remove. The new battery is represented at fig. 1—it consists of three troughs,

Fig. 1.

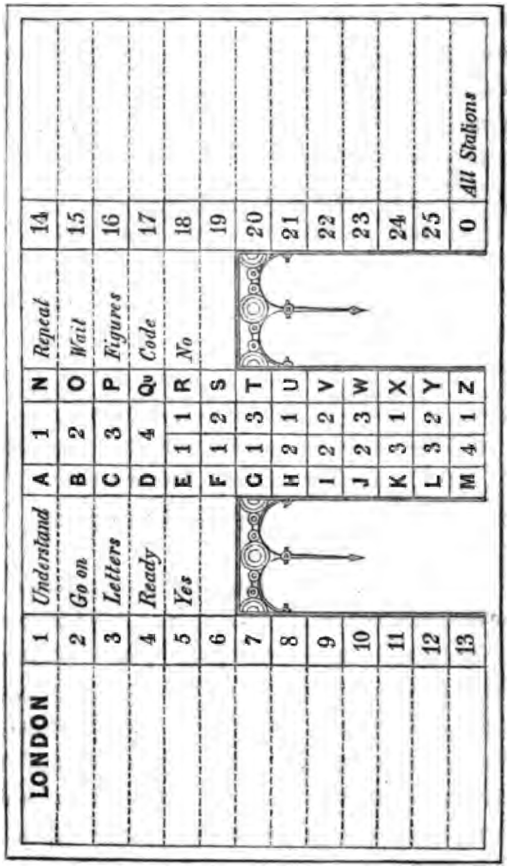


whereas others have only one; the upper trough, or reservoir, contains the acid, which is allowed to fall by very slow degrees through the funnel-shaped apertures into the next trough, which contains the series of metallic plates. The cells between the plates are filled with fine sand, which is always kept at the point of saturation; and the vitiated fluid, containing the sulphate of zinc (which is thereby kept in solution by its own specific gravity) finds its way through similar cones filled with a filtering material, to the lowest trough. By this arrangement it is found that the sulphate of zinc is carried off in combination with the waste acid; the consequence being a regular and uniform amount of power, kept up in proportion to the number of plates and strength of the acid employed.

TELEGRAPHIC INSTRUMENT.

The elevation of the instrument is represented in the frontispiece, and a more distinct diagram of the dial at fig. 2. By the arrangements here brought into action the whole of the alphabet is employed, and a conversation supported by spelling every word, or by such abbreviations as may be understood between any two operators; thus doing away with all arbitrary signs, and facilitating the learning of the instrument. It will be observed that the two centre columns are occupied by a series of figures from one to four, of which no two will be found alike; and left and right of these figures the alphabet is divided into two columns, from A to M and from N to Z. For A one motion is made with the left-hand indicator; for N, one with the

Fig. 2.



right; for B, two motions with the left; for O, two with the right; C and P, three motions in like manner; and D and Qu, four (u is always associated with Q). Between E and R will be found two figures of one—this means when you want E, give one motion with the left, *first*, and then one with the right; if you want R, one with the right, *first*, and then one with the left. It may be tabulated thus:

A—one left.
B—two left.
C—three left.
D—four left.
E—one left—one right.
F—one left—two right.
G—one left—three right.
H—two left—one right.
I—two left—two right.
J—two left—three right.
K—three left—one right.
L—three left—two right.
M—four left—one right.

N—one right.
O—two right.
P—three right.
Qu—four right.
R—one right—one left.
S—two right—one left.
T—three right—one left.
U—one right—two left.
V—two right—two left.
W—three right—two left.
X—one right—three left.
Y—two right—three left.
Z—one right—four left.

The words on the dial are represented by the same signs as the letters; on the left hand are the words, "understand," "go on," "letters," "ready," and "yes." On the right, "repeat," "wait," "figures," "code," and "no." These are all indicated by the same signs as A, B, C, D, and E, and N, O, P, Qu, and R, with this difference, that as at the end of every word spelt, you bring to a vertical position the left-hand

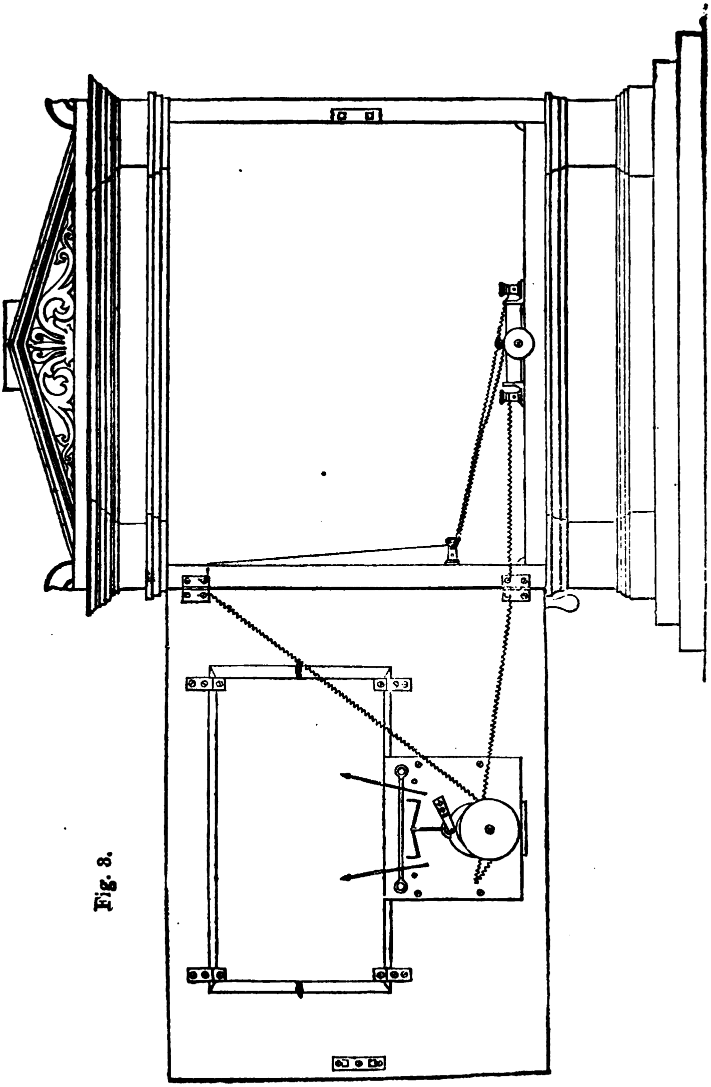


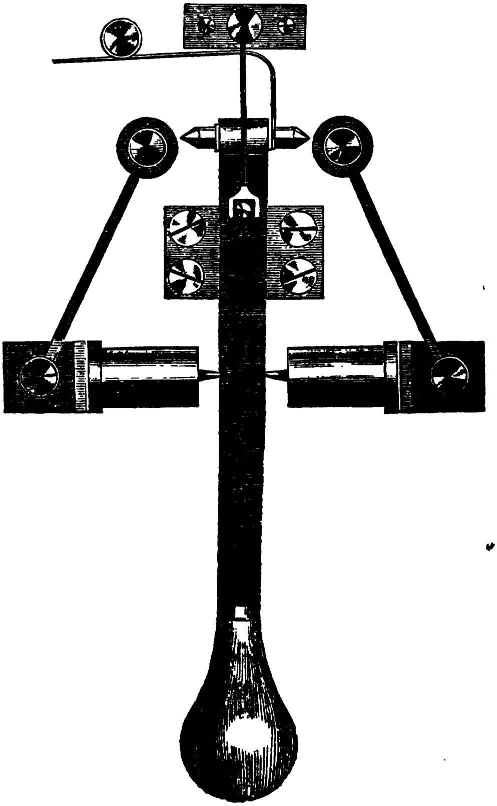
Fig. 8.

indicator, for (say) one second, which means "understand?" so you hold it up at the end of each of these fixed words, which indicates it is not a letter *only* that you mean. If the operator at another station does *not* "understand" the word, he brings to a vertical position his right-hand indicator (instead of the left) for a second, which means "repeat," and you repeat the word to him, so that a mistake can only be made in one word in a sentence, which is immediately rectified. To represent Figures, you first indicate "figures" by three motions to the right—and hold up the left indicator for "understand?" after which you make the same motions for any of the *figures* as for the letter on the same line all down the column, the figures in each column being represented in a precisely similar manner to the letters in each column respectively. The system, of course, requires practice to operate with facility and confidence, but it is exceedingly simple, and easily understood.

The internal arrangements of the instrument and the motion are also, as will be seen at a glance, very simple; the instrument with its door open is shown in the cut (fig. 3): the indicators are not magnets, but may be made of any other substance than iron or steel. On the operator at one end completing the circuit, the circular permanent magnet suspended between the coil of wire, seen on the door, is deflected in a like direction at the other end, and being attached to the T piece seen between the indicators, acts on the corresponding one, and thereby, according to the number of motions, represents the letter or figure intended to be communicated.

The arrangement for working the indicators is placed at the bottom of the instrument, and attached to the handle seen in front. It is represented in the diagram (fig. 4), and consists of a lever working on an axis, at whose extreme end are two steel points, which can be brought in connection with the brass pillars seen on either side. The cylinders, seen in front, contain two helical springs, which keep the handle of the lever always in the centre, the current being then broken and the circuit rendered complete for any other instrument; but when moved to the left, connection is made, which causes a current to traverse the coil of wire, and acting upon the magnet, gives motion to the right-hand indicator, but when moved to the right, the current is reversed, and motion given to the left-hand indicator. The electric current is admitted along the fine bent steel spring, seen on the left, and the straight steel spring seen at the extreme end of the lever. The deflector, whose handle is seen on the left of the instrument, outside, serves to isolate any particular station, by which the attendant is enabled to disconnect the communication with the general current, and in case

Fig. 4.



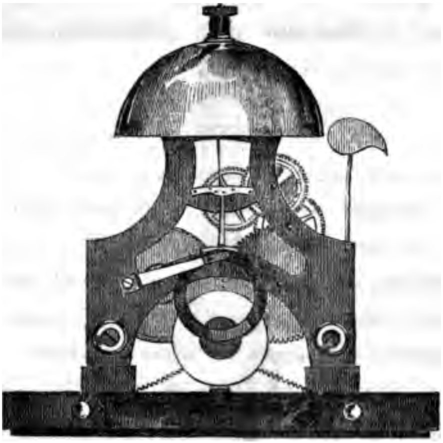
of an instrument being out of order, it can be immediately repaired without in the slightest degree interfering with, or disarranging the complete connection between all the other stations.

One wire only is required for the instruments, with an earth plate and connection at each station, which carries the current back by the conducting powers of the earth, by which means various stations can simultaneously be in communication upon different subjects.

THE BELL.

The action of the bell on Messrs. BRETT and LITTLE's plan is also a new adoption. Here a circular permanent magnet is employed; in con-

Fig. 5.



nection with this magnet is a tail piece or detent, which, when the circuit is not complete, falls into a catch in a small circular disc, and stops the action of the barrel spring and machinery; but, on completing the circuit, the magnet is deflected, the detent raised, and the spring raises the hammer, which strikes the bell *once* only, so that should, by any accident, a current of powerful atmospheric electricity find its way along the wire, there would be little danger of the bell arrangement being injured. One wire is solely used for the bells all along the line. The arrangement for connecting the bell movement with the conductor is precisely the same as that we have described for the instrument—with this difference only, that there being but one current, only one brass cylinder with its internal helical spring is used, while in the former case there are two.

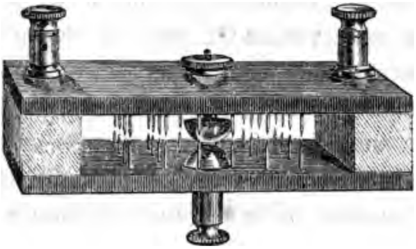
THE TUNNEL BELL.

This bell and its movement is precisely on the same principle as the instrument bells, but on a much larger scale, and giving forth a loud and deep tone; it can be fixed at either end of a tunnel, thus enabling an attendant to announce the ingress or egress of a train. Every train is to be provided with a portable, easily-applied instrument, by means of which the guard of every train will be enabled on any emergency instantly to communicate with the engine-driver in the following manner. Every carriage would be provided with connecting wires beneath, attached to the coupling chains, which would thus form conductors of the electric fluid, no matter of how many carriages the train is composed. On the tender would be placed one of the bells already described, with which the connecting wire would communicate, and at any moment of alarm the guard, by completing the circuit, would give instant notice to the driver to stop the train with the utmost possible dispatch. By the same arrangement a deflector being attached inside each carriage, any passenger could communicate with the engine-driver if required. If anything serious has happened, by hooking a connecting wire to the wire on the line, a communication is immediately opened with the stations from whence assistance would be obtained.

CONDUCTORS FOR CURRENTS OF ATMOSPHERIC ELECTRICITY.

The effects which atmospheric electricity has upon electro-telegraphic communication is daily felt, whenever a thunder storm happens, or during a highly electrically excited state of the atmosphere, by the continual rapid ringing of the bells, and when the current is powerful, doing considerable damage by seriously deranging the machinery, rendering them useless. The arrangement adopted by the patentees is seen at fig. 6. It consists of two small hemispheres of brass, about half an inch in diameter; the lower one a fixture, the upper one regulated by a screw with a nut in the upper plate of the frame. One of these conductors is to be placed in connection with each wire at every station, when the atmospheric electricity will be conveyed from one hemisphere to the other, and down a conducting wire into the earth, without in the least interrupting the galvanic current; care being taken that they are not in actual contact.

Fig. 6.



INSULATION OF THE WIRES.

In carrying the wire along a line of railway, the patentees propose to place the posts at regular distances of 55 yards, making 32 to the mile, every eighth post being the quarter of a mile, on which can be marked the distances required by act of parliament. It is necessary at every support for the wire that it should be in contact with a non-conducting substance, and also that it should be of such shape and so placed, that the wet can drip off without forming any connection with the earth. The mode of insulation adopted by Messrs. Brett and Little, after numerous experiments, is one which gives perfect security from any connection with the earth during rain or humid weather, from the wires becoming wet, and being placed in contiguity with the wooden posts, or sides of tunnels and arches, which thus form conductors to the ground. To every such support are attached curved iron brackets surmounted by glass or porcelain caps, through a knob on the top of which the wires are drawn; the cap is cemented on by any common cement or plaster. The sides of the cap project about an inch all round beyond the iron, so that, however wet they may become, the water must drip from them entirely clear off the wire above, or the iron and post below—thus forming perfect insulation. They are represented at fig. 7, and a sectional view at fig. 8.

Fig. 7.

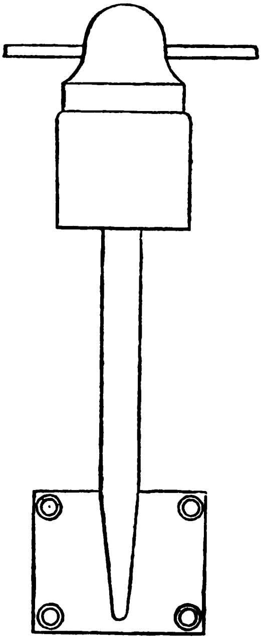
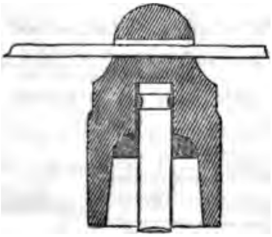


Fig. 8.



TIGHTENING THE WIRES.

A novel and economical method is adopted for tightening the wires when necessary. A frame fits tight over the upper rim of the insulator, in which is a ratchet wheel and pulley (fig. 9); a hand-vice, to which a cord is attached (fig. 10), is closed on to the wire at a

Fig. 9.

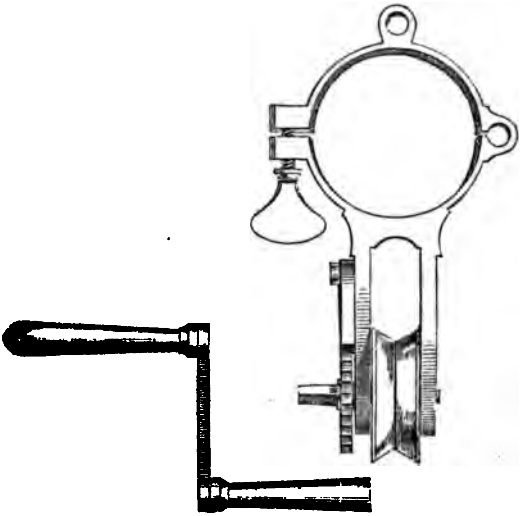
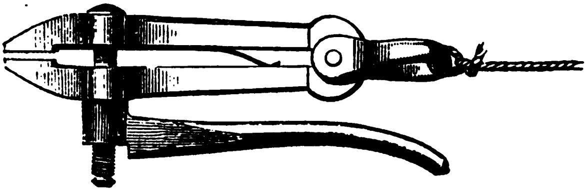


Fig. 10.



convenient distance from the rack, the cord is passed round the pulley and wound up tight by the aid of the ratchet wheel, and afterwards secured to the bracket; the same operation is then carried on at a distant post, after which the former one is removed and taken forward; and thus with two of these little machines, as much work can be done, and as effectually, as by the present mode of fixing one on either side for every wire at every five or six posts, where they get out of order by exposure to the atmosphere and the weather, independent of the additional points of contact offered, and the expence.

At Messrs. Brett and Little's Offices in Furnival's Inn, may be seen Seventeen Instruments in operation, representing as many stations; while the coils of wire through which the electric current passes is equal to 1000 miles of ordinary line wire, running in an uninterrupted course on a railway. In this room are also shown the several arrangements for complete telegraphic communication on a line of that length; the mode adopted for isolating one, two, or more stations, while others on different parts of the line are keeping up communications on different subjects—the modes of giving notice of accidents, or any circumstance of sudden emergency, by means of the portable apparatus; with the whole of the bell arrangement, and the various effects which may be produced with the "TELEGRAPHIC CONVERSER" at all or any of the stations. So simple and so delicate is the peculiar action of this invention, and at the same time so certain, there being no complex machinery or wheel work to overcome (the mere retardation of the current round the coils of fine wire being all that is required to deflect or reflect the circular permanent magnet), that less than one half the battery power generally employed is more than sufficient for all purposes; thus avoiding the costliness of an additional magnetic battery for every bell, and the numerous errors that continually happen from mechanical complication.

COMPARATIVE MERITS.

It is now proposed to contrast a few of the details in the working of the two telegraphs, explanatory of the improvements made and as bearing out all that has been said in the early part of these pages—taking each particular point in the same course as we have placed them in the description.

Double Needle Telegraph.	Brett and Little's Telegraph.
The Battery being upon an old and very inefficient construction, great inconvenience is experienced from the crystalisation of sulphate of zinc upon the plates, thereby weakening the power of the battery so much as to require frequent cleaning and fresh amalgamation to obtain sufficient power to work even the instruments; the bells requiring a separate Magneto Electric Battery to liberate them, thus incurring *this* additional expence for every set of wires.	The Battery is upon an entirely new construction, being *self-supplying*, and sufficiently powerful at all times both to work the instruments and ring the bells; and being likewise *self-purifying*, constant attention and cleansing are rendered unnecessary.

DOUBLE NEEDLE TELEGRAPH.	BRETT AND LITTLE'S TELEGRAPH.
The NEEDLES being magnets, are at all times affected by the atmosphere when charged with electricity, and caused to vibrate, thereby preventing the instruments from being worked however urgently they may be required, while from the same cause the poles of the magnets become sometimes changed, and the instruments thereby rendered useless. And, indeed, at all times, when in use, there is considerable oscillation, and such uncertainty in their action during conversation as frequently to require the *repetition* of a word or sentence.	The INDICATORS not being magnets, are perfectly free from vibration, and totally unaffected by atmospheric electricity, consequently the indication is *certain*, and the continued occasion for "repeat" avoided.
The BELLS, or ALARUMS, being on the electro-magnetic principle, their action is at all times uncertain, particularly as to the power of stopping them from ringing; as in case of the atmosphere being charged with electricity, the current enters the electro-magnetic coil, the keeper is detained, and the bell continues to ring, frequently to the entire derangement and destruction of the apparatus, and in other cases only stopping when the	The BELLS for calling the attention of the attendant being liberated by a similar motion to the telegraph, give separate and distinct blows, one or more as may be required, and should they by any possibility be liberated by a current of atmospheric electricity (for which, however, there is a preventative) the apparatus would not be deranged.

Double Needle Telegraph.	Brett and Little's Telegraph.
spring has run down. In addition to which from continued use a current of induced magnetism is retained, causing the bells to ring a greater length of time than is required or intended. An extra bell (as with the instruments) being required at the terminus for every set of wires.	
Two Wires are required for every *six stations*, and as the termini must, of course, be one of every *six*, they, of necessity, require two wires for every *five* stations, hence the number of wires, and consequent additional risk and expense from *another instrument* being of course required at the termini for every set of wires, and also a *clerk* to work each instrument.	One Wire only is required, by which *every station* on a line of railway (no matter how many) can be communicated with from either terminus, and one instrument only is required at the termini and at each station.
The Lightning Conductors, having the spheres secured, there is no means of adjusting them, hence the frequent cause of the bells being liberated and the instrument set in motion by the most trifling atmospheric charge.	The Lightning Conductors having a regulating screw at the top of the plate, may be adjusted so as to carry off the most feeble charge of atmospheric electricity with perfect certainty.

guard of every train will be enabled on any emergency instantly to communicate with the engine-driver in the following manner. Every carriage would be provided with connecting wires beneath, attached to the coupling chains, which would thus form conductors of the electric fluid, no matter of how many carriages the train is composed. On the tender would be placed one of the bells already described, with which the connecting wire would communicate, and at any moment of alarm the guard, by completing the circuit, would give instant notice to the driver to stop the train with the utmost possible dispatch. By the same arrangement a deflector being attached inside each carriage, any passenger could communicate with the engine-driver if required. If anything serious has happened, by hooking a connecting wire to the wire on the line, a communication is immediately opened with the stations from whence assistance would be obtained.

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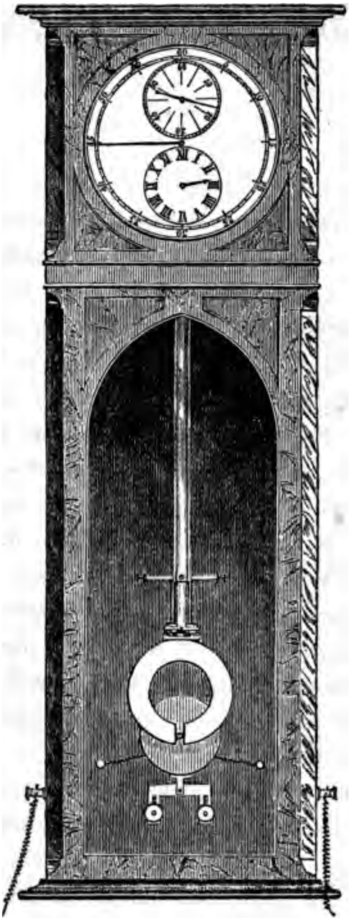
The effects which atmospheric electricity has upon electro-telegraphic communication is daily felt, whenever a thunder storm happens, or during a highly electrically excited state of the atmosphere, by the continual rapid ringing of

Double Needle Telegraph.	Brett and Little's Telegraph.
	coupling chains beneath, which thus become conductors of the electric fluid; on the tender is fixed a bell as before described, and in case of accident the GUARD can instantly signalise the DRIVER to *stop the train.* By the same means (if desirable), with a deflector in each carriage, any passenger can ring the bell. In the event of requiring assistance, the guard, or any attendant, can hook the connecting wire to the wire on the line, by which intimation will be immediately given to the stations.
Deflector.—Too complicated to explain.	A **Deflector** is attached to each instrument, by which any station on a line of railway not requiring to communicate with another can be completely isolated; so that in case of an instrument getting deranged, communication between the other stations would not be prevented. By this arrangement also, any TWO STATIONS could be communicating without preventing others, up or down the line, from conversing upon different subjects at the same time.

THE ELECTRIC CLOCK.

The power of galvanic electricity is by no means confined to telegraphic purposes; many highly ingenious and in part successful experiments have been made by different individuals, in its application to machinery, as a movtive power, and models have been exhibited of locomotive engines, printing machines, saw mills, &c., the only obstacle to the carrying them out in practice, being the too great expense of generating sufficient galvanic power. Messrs. **Brett** and **Little** have applied the same mysterious agent, as the moving power to a clock, and fig. 11, represents a beautifully constructed one, which may be seen in action at their offices. The permanent magnets are (as will be seen) placed at the end of the pendulum, and by their continuous action propel a train of wheels, about five in number, in the upper part of the clock, and thus its time is regularly kept; showing at the same time, in a most efficient manner, the principles before described on a larger scale. This clock is not placed in connection with the large batteries, which we have

Fig. 11.



before described, consisting of seventy-two pairs of plates, but is kept in motion by a separate small battery, constructed on the same principle. It may also be kept in action by having two series of one kind of metal buried in the earth.

OPINIONS OF THE PRESS.

From the Times, *August* 18.

We are glad to find that the attention of men of science is being directed to the perfecting of the electric telegraph, and to the developement of all the advantages of that wonderful agency, by means of which the workings of human thought and the human will may be communicated at the same instant to the most remote corners of the island. The invention and improvements of Messrs. Brett and Little, of Furnival's Inn, are highly deserving the attention of scientific men, since they aim at increasing the efficiency of the electric telegraph, in the first place, by generating and economising a more constant and powerful electric current; and secondly, by a new arrangement of the dial and indicator, insuring that communications may be made more safely and certainly than by the system now in use. The increased power is attained by a process which frees the copper and zinc plates in the batteries from the sulphate of zinc which ordinarily accumulates upon them, and which soon diminishes their force. Messrs. Brett and Little's apparatus consists of three troughs, placed one above another. The highest is a reservoir containing the exciting power, a diluted sulphuric acid; the middle trough is the galvanic battery, containing the copper and zinc plates, divided by cells or compartments of fine sand; and the lowest trough receives the vitiated liquid, which, having slowly dropped from the reservoir into the battery, has filtered through the sand in the latter, and thence percolates drop by drop into the receiving trough below. The diluted sulphuric acid drops from the reservoir into the galvanic battery through small cones perforated at the bottom, and is carried from the bottom of the galvanic trough by corresponding cones and perforations into the receiving trough. The sand which surrounds the metallic plates is thus constantly saturated, and, as a constant supply of fresh acid is kept up, and the vitiated fluid as constantly escapes below, the formation of crystals of the sulphate of zinc is prevented by this self-cleansing process, and the whole surface of the plates is exposed to the action of the acid. The fluid in the receiving trough is found to contain large quantities of the sulphate of zinc, which would, in the ordinary mode, have adhered to the plates and prevented the action of the acid upon the metal. The second feature in the invention of Messrs. Brett and Little is the new alphabet, and the altered face of the dial adopted by them. The indicators attached to the dials hitherto in use are generally magnets, and their incessant vibration through electrical and other disturbing atmospheric causes has produced much uncertainty and confusion in communications. The indicators in the dial before us are not magnets, and show no vibration whatever. Another point of difference is, that in the dial of Messrs. Brett and Little every letter of the alphabet is given, with the means of expressing it, so that no symbols or arbitraries need be used, and a sentence may be perfectly and entirely spelled, and transmitted as it is written. While we thankfully accept every attempt to improve the alphabet of the electric telegraph, and to make a single wire discourse the varied language of news, business, or politics, we may be pardoned for suggesting that there is work for a very high order of genius in the discovery of the new symbolic language necessary for the speedy transmission of complex and accurate intelligence, and that it is not to the mechanician that we have a right to look for the last and highest developements of what we may call "the new electric language." Without undervaluing, too, the advantages of having every alphabetic letter in the dial plate, we do not anticipate that the use of "arbitraries, such as would be used in shorthand," is thereby rendered unnecessary. On the contrary, it is by no means improbable that before the electric telegraph can be fully enlisted into the service of the public press, a class of persons must arise capable of communicating complex ideas by its aid with much greater facility and distinctness than at present; and these individuals will form as distinct a profession, perhaps, as the shorthand writers of the present day. We say this without wishing to prejudice Messrs. Brett and Little's claim of having produced the most perfect telegraphic alphabet now in use. In one room, the patentees have seventeen instruments completely fitted up, representing seventeen stations; and the electric current which agitates the indicator in each instrument simultaneously traverses a coil of wire equal to 1,000 miles in length! We have left no space to describe the patentees' other electro-telegraph improvements—their new and ingenious bell apparatus, their lightning conductors, and insulator. The working models of their various inventions make an exceedingly interesting exhibition to scientific men, and to the scientific world and the railway interest we leave it to decide upon their advantages and superiority.

From the Daily News, *August* 16.

The importance of the electric telegraph as an instrument of police, a power in the hands of government, and a means of social communication, has been already established. Next to the application of the principle of steam, it exhibits the most useful conversion of an abstract principle to the practical purposes of every-day life. Like all new inventions, the perfecting of the machinery through which it acts must be a work of time. The electric telegraph was first put into extensive operation in the United States of America, and the system adopted was that which is known as the telegraphic alphabet of Professor Morse. Subsequently, Messrs. Cooke and Wheatstone took out patents in this country for some valuable improvements adopted by them: and it was only last year that Mr. Highton, of Rugby, obtained a patent for some additional improvements. Much that was desirable, however, remained to be accomplished.

On Saturday last, we had an opportunity of witnessing in operation the improved telegraph of Messrs. Brett and Little, of Furnival's Inn, through seventeen instruments, and coils of wire equal to one thousand miles, and could not help being struck with the simplicity of the machinery, and the certainty and accuracy of the result. The first improvement effected by the patentees has reference to the apparatus for generating the electric current—the galvanic battery. It is well known that the action of the sulphuric acid on the zinc plates of the battery produces incrustations, called sulphate of zinc, which considerably impair its operation, and require it to be frequently cleaned. This evil is remedied by using three troughs, one placed over the other. The topmost contains the dilute acid, which drops gently through small apertures in the bottom into corresponding apertures in the second trough. In this are contained the metallic layers of zinc and copper, the interstices between which are filled by a fine sand. The advantage of the sand is that it absorbs sufficient moisture from the acid to excite the required action, and no more; the superfluous acid being allowed to percolate through this second trough also by means of apertures filled with sponge, on the principle of the common water-filterer, in the last trough which receives the vitiated liquid. The effect of this arrangement is to keep the plates clean, and thereby to render the electric current more equable and powerful. It is also well known that the system used at present is liable to be affected to such a degree by the electric condition of the atmosphere as, at times, to render the telegraph perfectly useless in the hands of the operator. The indicators, *being magnets*, tremble as "things possessed." The bells along the line are set a ringing, and when the attendants proceed to know what is the matter, they find it is no artificial communication from any of the railway kings, but that "Jove's messenger"—*cœlo fulmen demissum*—has being playing pranks with their wires. It is obviously a matter of importance, in such a case, to know whose the thunder is, and this the patentees effect by an ingenious contrivance, which, when the disturbance proceeds from the electric state of the atmosphere, causes a clear, isolated sound very readily distinguishable from the ordinary jingle of the bells, by which a person claims the attention of another at a distance. Where intelligence of an accident is to be transmitted, a strong and striking sound is given out for attracting the immediate attention of the attendant to the telegraph. The same battery that is used for ringing the bells is also employed to give action to the telegraph, thus obviating the expense and inconvenience of requiring a separate battery for each purpose. It remains to give a description of the dial-plate and its admirably arranged and easily comprehended system of letters and figures. This plate is about six inches high and ten broad, and is divided in its height into several compartments. There are two indicators, or hands, which are not magnetic. These are moved by a sort of double-headed hammer, in the form of the letter T, which is attached to a magnetised ring on the inside of the telegraph, in the upper periphery of which ring the centre of motion resides. The indicators are inclined, when at rest, at an angle of about 60 degrees; when in action they move to a vertical position, just as we can imagine the hands of a clock or watch being at rest at the hours indicated by 8 and 4, and on motion being imparted to them, rising rapidly to the vertical position indicated by the hour of 12. The letters of the alphabet are distributed into two vertical columns on the dial, the first or left-hand column comprising the letters from A to M; the second, or right-hand column, the letters from N to Z. Between A and N, the first letters of their respective columns, the figure 1 is placed, the meaning of which is, that one motion of the indicator from its angular position to a vertical one, will signify A or N. But which? Nothing more easily determined. If it be the left-hand indicator that moves once, the first letter on the left-hand column is meant—that is A. On the contrary, if it be the right-hand indicator that moves once, the first letter in the right-hand column—that is N—is signified. In like manner, between B, the second letter of the left-hand column of letters, and O, the second letter in the right-hand column of letters, 2 is inserted, which means, that to indicate B, there must be two motions of the left-hand indicator; and to indicate O, there must be two motions of the right-hand indicator; and so for the letters C and D, and P and Qu (u being always joined with Q) respectively, there must be three and four motions of the indicator. Now, as it would manifestly occupy some time, and may give rise to error, if 13 motions of the indicator were required for the letters M and Z, which stand thirteenth in their respective columns, a different arrangement has been adopted from the letter E, in one column, and the corresponding letter R, in the other column, downwards. From these letters downwards, the figures, like the letters, are distributed into two columns. Opposite to E, stands the figure 1, and opposite to R stands the figure 1 also. How, it will be asked, are these letters to be distinguished from each other, and from the letters A and N, which are also indicated by the figure 1? Simply thus: If the letter to be transmitted be E, *one* single, distinct motion of the left-hand indicator (E being in the left-hand column of letters) must be *first* made, and the right hand indicator must be then made to move *once*, by reason of its having figure 1 on the right hand column, on the same line with letter E. If, on the contrary, the letter R is to be transmitted, one motion of the right-hand indicator (R being in the right-hand column of letters) is to be *first* made, and then one by the left-hand indicator. Thus, instead of five motions of the left-hand indicator being required to indicate the letter E, but two are required, care being taken that the *first* motion is made by the left-hand indicator, and the second by the right-hand indicator. The remaining letters are indicated in a similar way. To spell the word NO, then, by this invention, we have merely to move the right-hand indicator once: that means N. Discontinue the motion, and the indicator, by mere gravity, falls into its angular position of rest. Again, move the same indicator twice: twice it assumes the vertical position, and you have the letter O. NO.

Again, to spell the word ARE you have only to move the left-hand indicator once for A; the right-hand indicator once, and then the left-hand indicator once for R; the left-hand indicator once, and then the right-hand indicator for E, and thus you have "are," the first word of "are you ready?" From what has been said it will be seen that this may be called the *alphabetic* telegraph, and it is unquestionably more simply than the one in use at present, in which a system of arbitraries must be employed. But if there be any advantage in using a symbolic system, as there sometimes may where great expedition is required, that advantage is possessed by the telegraph of Messrs. BRETT and LITTLE as effectually as by any other. The patentees have discovered very ingenious contrivances for preventing the escape of the electric current from the wire lines while passing through the posts, by a more perfect means of insulation than has been heretofore adopted, and also for giving the lines greater tension. Experience and use can alone apply the proper tests to these improvements; but, as far as we could judge of their operation, they are likely to prove of considerable importance.

From the MORNING ADVERTISER, *August* 16.

On Saturday we inspected Messrs. BRETT and LITTLE's improved electric telegraph, and from a close examination of its construction and mode of working can confidently designate it a great improvement and simplification of the contrivances at present in use, for applying the mighty power of electricity to the practical use of a medium of communication between the points "wide as the poles asunder." For the more easy comprehension of the improvements of the existing system of electric telegraphs effected by the patentees of the instrument in question, we must first briefly describe the principle on which each depends. As its name imports, the electric telegraph is dependent on the formation and completion of a galvanic or electric circle, the stream of electricity being generated either by mechanical or electrical means, the latter, however, being that most generally employed, and by different applications of this electric current, a magnetised needle is readily made to deflect, east or west, from its otherwise constant position, when it points north and south. This is the primary basis of all electric telegraphs. To furnish the requisite stream a battery is formed, consisting of a trough of wood, divided into twenty-four cells; these are filled with fine silver sand, well moistened with dilute sulphuric acid. The walls of each cell form twenty-four double plates, alternately of zinc and copper throughout the whole series. Now, as far as the telegraph is concerned, if a copper wire, passing out from the zinc pole or extreme plate at one end of the trough, be brought in contact with a freely suspended magnet, it will cause it to deflect *westward*. If from the other end or copper pole, it will cause it to deflect *eastward*, or it is said the current is reversed. And the same results would as instantaneously occur if the wire were either one yard long, or one thousand miles distant from the trough in a continuous line. Making a signal, then, is in fact subjecting a freely suspended magnet to the action of what is termed the positive, or the negative wire of a galvanic battery. If the wire were 50,000 miles long, and there were fifty needles on it, each and every one would obey the impulse at the same moment. Well, then, there may be two needles on a dial plate. To make one of them deflect twice to the left may signify A, thrice B, and so on, the other needle for parallel and simultaneous signs and movements. The first improvement introduced by the patentees is in the battery; in the old form the sulphuric acid in the troughs by its constant action on the metal plates oxydised their surface, and caused the deposition of crystals of sulphate of zinc, whereby the plates were gradually eaten away, and the efficiency of the apparatus much impaired. This has been obviated by filling the troughs with fine silicious sand as a mechanical absorbent for the acid which is allowed to drip upon it from nipple-like appendages above, while below similarly-constructed contrivances filled with sponge permit the saturated sand just as equally and rapidly to yield the acid by transudation. In this way the formation and deposition of oxide and sulphate of zinc are prevented; clean acid is always presented to a clean surface, and the trouble and expense of constantly renewing the plates are spared. This is an improvement that must prove of the greatest utility in all cases where a galvanic battery is in constant use. The next is not only of a useful, but of a neat and simple character. It is indispensable that the wires of an electric telegraph should be perfectly insulated throughout their whole length from all contacts with substances that would interrupt the passage of the galvanic current in its passage from the point whence the message is sent to that to which it is to be conveyed. As all railroad travellers must know, the wires are carried along the line on posts raised by the side of the road, but insulated from all contact with them by pipes of pottery, through which they pass. If, however, by means of a shower of rain (water being a good conductor of electricity) the wires are brought into contact with the post, the current passes down it into the earth, and the galvanic circle between the points of communication is interrupted, and the signal lost. To obviate this Messrs. BRETT and LITTLE have invented an ingenious contrivance, of thick strong glass, in form not unlike a church bell or inverted tulip, only that the side is straight instead of having a curled and thin lip. This is placed mouth downwards, upon a curved style, or iron bracket nailed to the post. The connection between the glass and iron is made in the upper and inner part of the bell by a suitable cement. Then, through what may be described as the shank of the bell, or its upper and outer crown, the wire is threaded: by this contrivance, however wet the wire may become, it is impossible the moisture can become the medium of its communication with the ground; the wet falling on the glass drips off from its lower edge, and cannot even render damp the interior, much less communicate with the iron supporter. We think this a most admirable and ingenious contrivance, and there is every reason why it ought instantly to replace along the line the imperfect bit of stoneware used as the needle eye of the suspension posts. At present the signal of a desire to communicate is conveyed by the stroke of a hammer on a bell, but during a thunder-storm the electricity of the atmosphere is very liable to set the bell ringing, and thus produce considerable confusion. This defect Messrs. BRETT and LITTLE have in a great measure remedied by the introduction of a disc with a notch cut in it, the revolution of which sets a bell-hammer in motion, and as the disc can revolve only in one direction, under the influence of the current from one pole of the battery alone, one-half of the effect of atmospherical disturbance is at once neutralised, while the succession of sharp isolated sounds it would produce would easily render it recognisable. The electric current is also susceptible of passing upwards from the earth along the wires, and the contrivance for tightening them appended to every fifth post is no desirable appendage even in the view of the matter: it is well, therefore, that the patentees have invented a portable contrivance which entirely supersedes the necessity of the old machinery for that purpose. With the new key a mechanician may tighten twenty miles of wire in a day. The ordinary lightning conductor is placed between the wires as they are carried into the room where the instruments are fixed. Now galvanic electricity, that is such as is generated artificially, is said to possess low tension; if contact be complete, it may be easily led; far otherwise if there be the slightest break in the continuity. Atmospheric electricity, on the other hand, is of high tension. It will leap from point to point; will leap a vacuity to the next landing-place; and seems eager to reach the earth, and so restore the natural equilibrium. The patentees have invented a lightning-conductor, constructed on the appreciation of these principles. If the convex surface of two minute brass cups be brought within a quarter of an inch in contact, the galvanic current will not leave its wire connected with the upper cup to escape to the lower cup, and then to another wire connected with that cup and leading to the earth; but atmospheric electricity will. And to aid its escape in this harmless direction, a number of of metallic points are placed almost in contact with a polished surface of two square inches of metal. As regards the mode of directing the signals, important and most excellent improvements have been made. Not the least of these is the use of two needles instead of one on the same dial face, by which the signs for the various letters are very much simplified. Another is the absence of all vibration of the needles, by which in the systems at present in use very great confusisn and delay is caused. In Messrs. Brett and Little's telegraph, the needle, after being inflected, whether to the right or to the left, at once becomes stationary. The last improvement we would point out is one of the greatest. By the system now in use a message cannot be sent to one station without the bell ringing and needle working at every other station also, there having until now been no method of insulating the several stations not concerned in the message. In the system in question, however, this desirable object is effected by a simple contrivance, by means of which a station can insulate itself from all but that with which it has to communicate, so that two or more sets of communications can be carried on simultaneously. Thus, for instance, on the North-Western line, their arrangemedts will enable London and Birmingham to be talking about the funds, while Crewe and Liverpool, on the same line of wire, or Crewe and Manchester, are asking questions about the price of corn or the result of an election. By another peculiar arrangement, one efficient battery, of moderate power, is sufficient for the line, however extensive; and this is managed by carrying the poles of the battery continuously and completely from end to end, thus avoiding the necessity and cost of a battery at every station. In conclusion, we must again express our decided opinion that Messrs. Brett and Little's electric telegraph possesses great advantages over those now in use, and cannot fail to prove as successful as it deserves.

From the Morning Post, *August* 17.

We have been favoured with a private view of this ingenious piece of mechanism, for which a patent has just been taken out by Messrs. Brett and Little, the inventors, and which, in its construction and mode of working, presents several improvements upon the telegraphs now in use. Those ingenious mechanists have devoted years of study to the whole system of telegraphic communication, and the consequence is, that in almost every department of that marvellous power they have modified, simplified, and improved the inventions that are now in use, from the battery up to the indicators. By their new system the galvanic plates are less liable to decay, the signal bell is more under control, the wires more isolated, and the indicators more distinct, while the alphabetical index itself is more simple than in any other system that we have seen. To describe the ingenious processes by which these results are brought out, as well as the beautifully simple mechanism which is employed, would transcend our limits, and after all would give but a faint idea of the reality. One important advantage the patentees consider they have gained, which, if borne out in practice, will certainly give their instrument a decided superiority Every one conversant with electro-telegraphs is aware that they are at all times liable to the action of atmospherical electricity, and that in a thunder storm, in fact, they cannot be worked at all; while the signal bells in particular, are so subject to its influence, that they are often set in motion and broken with the violence of their own action. Now this disadvantage Messrs. Brett and Little consider they have overcome by making use of a very simple and beautiful piece of machinery, by which, even if a current of atmospherical electricity should find its way to the wire, the moment it has passed over, the action of the bell may be arrested. They have also added an alarm bell, quite distinct from the other, by which an accident at any point on the line of a railway would be instantly made known over the whole distance. Instead of the system now in use, by which the number of wires is increased in proportion to the stations where the telegraph is used, thus frequently giving it an unsightly appearance, as well as increasing the chances of accident, Messrs. Brett and Little propose to work their telegraph for any distance with only two wires, one for the bell and one for the communication. Altogether the instrument seems to be brought as near perfection as the present state of science will admit of, and we trust the ingenious patentees will now reap the full reward of their labours.

From the MORNING HERALD, *August* 19.

Within this day or two, Messrs. Brett and Little, of Furnival's Inn, have invited the attention of the scientific world to an examination of their new electric telegraph, respecting which considerable curiosity had been awakened. Having been favoured with a private inspection of the various apparatus which the patentees have constructed, and witnessed their practical application, we have strong reasons for believing that Messrs. Brett and Little's invention is by far the best that has yet been offered as a means of instantaneous communication, possessing several obvious advantages over others in contemporary use—that on the score of economy being among the most prominent. The improvements consist in the adoption of troughs, which, by means of the conical appendages, permit the passing off the waste acid through silicious sand, obviating the formation of the oxydised surface, which has hitherto obstructed the action and occasioned loss of time in the periodical cleanings—to the avoidance of the effects of atmospheric electricity, so often seen in the tremulousness of the needles, to the destruction of all correspondence during the time it lasts, by the use of glass or porcelain insulators, in shape like an inverted bell, lodged internally upon the point of a projecting arm, by which the accumulations of moisture are prevented from becoming the channel of circuit to the ground, and occasioning the disturbances alluded to—the reduction of the suspended lines by the employment of a single battery for the developements of the bell and the telegraph—together with a variety of subordinate contrivances, not less ingenious than useful, such as arrangements for holding different conversations between different stations on the same railway; the proclamation of accident by means of an ominously-sounding bell; modes of quickly tightening the parallel wires when relaxed; the improvement of the lightning conductors, &c. In fact, there is scarcely a necessity that is not supplied, and that by mechanism of singular simplicity; while the efficiency and promptitude of the instruments may be tested experimentally by a variety of model operations, in all cases most satisfactory. Letters are used instead of arbitrary signs, during the process of communication the numerical oscillations of the needles suggesting, according to a pre-arranged table, the letters or figures implied, and the advantage in this method is found by the ease with which the art of "conversing" may be acquired, a few minutes' practice being quite sufficient to induct a stranger into a moderate executant facility. The needles, it may be mentioned, deflect with a firmness and decision wanting in other telegraphs, whereby the meaning of the successive motions becomes immediately and unmistakeably accessible.

It is, however, impossible, in a brief notice like this, to refer with much precision to the peculiar merits of Messrs. Brett and Little's invention. The patentees are now submitting it to the examination of all who are interested in the progress of national intercommunication; and hitherto the opinions of those who have investigated are, we learn, much in its favour. The ingenuity visible throughout its details reflects the highest credit upon the two gentlemen to whose intelligence it owes its origin; and we cannot but foresee that it will not be long before many public proofs are afforded of its superior and undeviating utility.

From the STANDARD, *August* 19.

[Description quoted from the "MORNING HERALD," August 19.]

From the SUN, *August* 20.

[Description quoted from the "TIMES," August 20.]

From the SHIPPING GAZETTE, *August* 18.

[Description quoted from the "MORNING POST," August 19.]

From HERAPATH'S JOURNAL, *July* 31.

Having been favoured with a private and strictly confidential view of this invention, we are not at liberty to divulge the principle or details. We may, however, observe, that the instrument is exceedingly simple, and the indications steady and certain; and, when under the most rapid communications, free from that vibration and consequent loss of time we have observed in others. The small amount of power it requires to work any number of instruments through distances of coiled wire, estimated to be equal to 1,000 miles straight, struck us very forcibly. One of the arrangements shown us has certainly reached the *ne plus ultra* of simplicity. Of course, with simplicity goes inexpensiveness, which is a chie feature in Brett and Little's telegraph.

The patentees are two young men who appear thoroughly to understand their subject and the requirement of the public. We have been rather surprised, having heard so much from private quarters of this invention, at the delay in not trying it upon some line. The reason seems to have been a determination to bring it out so perfect as to leave nothing further to desire.

We understand that the patentees have resolved to work the telegraph on the most liberal principles, by granting licenses without any control as to its use. More than one large mercantile house, we are informed, has decided on using it. So that the telegraph is not likely to be confined to railways.

From the RAILWAY TIMES, *August* 28.

We have attended, by invitation, the exhibition of an electric telegraph, invented by Messrs. BRETT and LITTLE, of Furnival's Inn, London, of whose skill and deep knowledge of the electric phenomena this beautiful instrument bears the strongest evidence. The specification of the patent, enrolled by the inventors, represents the instrument as containing "improvements in the construction and arrangement of the several parts of, and in the means of applying the electric current to the working of electric telegraphs, by which visible signals may be indicated or transmitted, or communication conveyed from one place to another." The primary feature of their invention is simplicity. The mystic operations of the galvanic fluid are conducted through the means of apparatus so simple, yet so sure, that the mind is overwhelmed at the conclusions to which it is forced to submit, on the display of the unerring accuracy and wonderful scope of utility attained by a mechanism so minute, so primitive. We have not, however, the space to dilate upon the beauty of contrivance and poetical associations of this invention. We can but view it in connection with those purposes of sterner need which attend railway operations. Reluctantly leaving, therefore, to others the details of the working principle, we feel ourselves compelled to regard this invention solely in its applicability to those operations. Here, in the first place, we must observe that "simplicity" has been hitherto the *desideratum* in all the contrivances for securing electrical communications. Relying more or less upon symbolic forms, the very language of the art has been narrowed and limited to a few; in this respect the telegraph of Messrs. BRETT and LITTLE has a high advantage; it provides for the initiated and the uninitiated, equally, the means of occult or open expression of their thoughts. The alphabetical arrangement is at the disposal of those who can only employ the latter, while the "code" may be employed by those whose systems are more matured, or whose intercourse requires either secrecy or a higher degree of despatch. We might here enter into a wide explanation both of the tabular aspect of the dial-plate, and of the position and action of the indicators; but we have found such explanations, however elaborate (and we have ourselves proved it in this very instance) fail to convey any adequate idea of the mechanism employed. Suffice it, then, to say, that there is a marked superiority in the external modes of communication, both as regards the arrangement of the things signified and of the indicators. These last are not magnetised, as in other instruments, and are consequently free from any magnetic disturbances.

We come next to consider what "simplification" has done to ensure attention in those who have charge of the apparatus when in action. In this respect, we find a marked improvement in the *bell*, by which the signal is given of a desire to communicate. The blow of the hammer is *one*—and not a continuous jingling—it is, however, capable of instantaneous and frequent repetition; and it is wholly exempt from that action of the atmospheric currents which have so frequently given the alarm upon lines supplied with the older apparatus. In connection with this most important part of the instrument, as regards railways, must be noticed the alarm-bell itself, which can be sounded simultaneously at all the stations on the line (if required), pronouncing its warning in one clear solemn note. It is to be observed that Messrs. BRETT and LITTLE have dispensed with the ponderous magnetic apparatus for ringing the bells hitherto employed, at a cost of eight guineas each bell, and they effect their purpose by the same current which serves for the working of the entire instrument. When we have stated that these results are unerringly attained, and that intercourse, symbolic or diffuse, may be conveyed, and attention awakened at a distance of 1,000 miles, through the means of an apparatus no larger than a library clock, and so simple that in a few hours one might master its language, we think that we have sufficiently ensured attention to these parts of its organisation; but the ingenuity of the inventors has not rested here. It is known that the batteries of the ordinary instruments are liable to a great and continuous loss of power arising from the crystallisation, or deposit, of the zinc in a sulphated state. To obviate this defect Messrs. BRETT and LITTLE have provided an ingenious filtering-apparatus, through which the vitiated fluid passes away, and the action of the plates is preserved for a very long time in its full force, and in a state of purity. Again, the usual ratio between the distance and the generating power of the galvanic battery has been, on an average, one pair of plates to each mile. The battery of the present apparatus consists of seventy-two pairs of plates in three troughs, and the power of these is exhibited in action through ten coils of wire, equal in amount to an extent of 1,000 miles. The contrivances for securing the perfect insulation of the line-wire of communication, and for protecting it from the action of the rain at the posts or brackets used to sustain the wire, are novel and effective; in form they resemble bells; they are of glass, and are suspended, mouth downwards, in such a manner that the moisture cannot come in contact with the bracket, but will drip from the lower edge of the cup. There remains but one other point, that is, the prevention of disturbance from atmospheric electricity; this is attained by the employment of a small machine, formed of two hemispheres of brass, capable of such nice adjustment as to secure most effectually the passing-off of the aërial current without the possibility of interruption to the feebler tide of the galvanic fluid. The extreme simplicity of the whole system, compared with the important results obtained, as we have before observed, calls up in the mind a feeling of incredulity from an excess of its conviction. Yet every effect which we have pointed out is produced with the most unerring precision; signals are sounded through an equivalent of 1,000 miles; stations are isolated and restored to communication momentarily; intermediate stations detach themselves from the main line, and yet hold converse; and all in defiance of atmospheric influence, through a few inexpensive agents (seventeen telegraphs being set in action by the three troughs before mentioned, and as many more might be). We cannot but augur for this invention the highest success. The change of arrangement which it would involve may for a long time prevent its adoption upon lines already furnished with telegraphic apparatus; but it appeals to those upon which the means of communication are either incomplete or wholly absent, with claims that the present state of railway management will do well not to disregard, viz., simplicity (an important element of safety) and economy.

From the RAILWAY GAZETTE, *August* 21.

]Description quoted from the "MORNING HERALD," August 19.]

From the RAILWAY RECORD, *August* 21.

We had an opportunity, during the week, of inspecting the electric telegraph of Messrs. **BRETT** and **LITTLE**, in Furnival's Inn, Holborn, and were exceedingly gratified with the result.

The improvements in the galvanic battery, or generator of the electric fluid are manifestly most important; and these improvements may be best shown by briefly explaining the action of the common battery now in use by the various railway companies. It is well known that the ordinary battery consists of a series of cells, into which is placed alternately a number of pieces of zinc and copper. Into these cells is poured dilute sulphuric acid, which acts upon the zinc, forming oxide of zinc. The acid now comes into play, removing the oxide to form sulphate of zinc; but as soon as the liquid becomes saturated with this salt, no farther galvanic action can take place. The great object, therefore, is to remove this salt as fast as it is formed, which is most effectively done by the arrangement of Messrs. **BRETT** and **LITTLE**. Over the top of the cells is placed a trough, with a number of cones corresponding to the number of cells in the battery. The trough is then supplied with dilute sulphuric acid, which is continually dropping into the lower cells; so that, as fast as the sulphate of zinc is formed, it falls by its own gravity through a hole at the bottom of the cell, and is replaced by the dropping tube at the top; the battery being thus self-feeding in its principle and continuous in its action. This is unquestionably the most constant battery we have yet seen. The alarm or signal-bell is also much improved, being much more certain in its action, and free of the expensive machinery now used by the railway companies. The indicating instrument, too, is by far the most perfect apparatus of the kind which has yet come under our notice; for, in addition to its simplicity and economical arrangements, it possesses *one* advantage which must strike the most common observer. In the ordinary needle-instrument, the needle or pointer is constantly vibrating when in action, which renders it the most difficult thing possible to follow it correctly; but in the plan before us, the pointer acts with a *dead beat*, similar in appearance to the seconds' hand of a clock. The motion is produced by the following simple plan: There are two small coils of insulated wire, in the centre of which moves a small circular permanent magnet. The electric fluid passing round these coils, deflects the magnet, which, pressing against a cross-shaped lever, communicates motion to the pointer, which does not require to be magnetic, but is so adjusted as to return to its required position. Messrs. B. and L. have also constructed a very complete insulator, to attach to posts supporting the wire down the line. This is made of glass or other non-conducting substance; and the possibility of any accumulation of wet or moisture conveying the electric fluid into the earth, is thus effectually guarded against—a difficulty which is often met with in the present plan. The patentees have also other arrangements for conveying private signals—a new alarm bell, in case of accident on the line; a new lightning conductor; and various other improvements, which appeared to us of importance, inferior only to the more striking features of the new patent which we have noticed above.

These instruments were tested while we were present, and signals transmitted through an immense quantity of insulated wire, arranged in the form of coils; and during the passage of the electric fluid, the action of the pointer was so steady and uniform, that, as far as the machine is concerned, nothing remains to be desired.

In concluding this brief notice, we cannot refrain from congratulating, not only the patentees, but the public at large, on the manifest "steps in advance" which the present improvements have secured in this magic means of communication.

From the MINING JOURNAL, *August* 21.

The magnificent discoveries which have, of late years, been made in the properties and powers of that extraordinary element—electricity, and the important improvements which have been carried out in its application to telegraphic purposes, has—and it may be called a curious coincidence—kept pace with the developement of the railway system; for, without a means of instantaneous communication from station to station, the latter could never have been brought even to its present advanced state, much less to that degree of perfection which it must reach at no distant day, as its defects become palpable, and as the inventive genius of the human mind discovers and applies corrective remedies, rendering what is now complex and uncertain simple and complete. Electricity, applied to telegraphic purposes, is comparatively of modern date; and, during the few years in which its present course has been run, the advance has been extraordinary—improvement has succeeded improvement in rapid succession, until Science herself has been taken by surprise, and wondered where the genius of her sons would stop. Still, in all the telegraphs hitherto in use, there have been objections in detail of a more or less serious description, such as vibration of the needles, imperfect insulation at the supports for the wires along the line, by which a large portion of the fluid finds its way into the earth; the subjection of the wires to the action of atmospheric electricity, by which the machinery becomes deranged, and not unfrequently broken and shattered; and various other evils, to which the attention of those connected with the electric telegraph has long been ineffectively directed. It has been left for Messrs. BRETT and LITTLE, of Furnival's-inn, to surmount every difficulty which has yet presented itself; and, while their Electro-Telegraphic Converser is so far free from imperfection, it is, in all its details, a most simple and easily-understood machine. We shall now endeavour to give as clear and definite a description as our limits will allow, and, in the first place, to begin at the beginning, to describe the improvements they have made in the prime mover itself—the battery. In the common battery it is well known that much inconvenience arises from the accumulation of crystals of sulphate of zinc (when sulphuric acid is the exciting liquid) on the plates, which renders that portion of metal useless, and thus the intensity of the current is continually diminishing, and much trouble is occasioned in cleaning the plates. To remedy this defect, Messrs. BRETT and LITTLE's battery is composed of three troughs, one above another. The top one contains the acid, which falls drop by drop through funnels into the next lower one, which contains the cells and plates of metal—these are filled with sand, which retains just sufficient moisture to keep up the excitement, while the superfluous liquid, charged with the sulphate of zinc formed, falls through funnels filled with sponge (thus acting as a common filter) into the lowest trough, which is merely a small rectangular cistern. By this means a uniform current of electricity is secured, the plates of zinc remaining clean. In insulating the wires at the suspension posts, an ingenious contrivance has been adopted:—A hollow cap of glass is fixed on the top of an iron support, screwed to each upright, the wire passing through a hole in the top. As the cap projects full an inch on all sides from the iron, all conductive connection with the earth is cut off, the water during wet weather falling clear off all round—a striking familiar simile is a flower pot on a stick in a garden for catching earwigs. For the purpose of tightening the wires when required a simple machine is used, which quickly and effectually performs its office, without cutting and rejoining the wires; it consists of a ring of iron, with an opening to pass the wire, and which exactly fits the top of the insulating caps; attached to this is a pulley with a ratchet wheel and spring; a pair of forceps (to which is attached a chain) is fastened to the wire, the chain is then passed over the pulley, which is wound up to the point required, and held in its place, while the same operation is performed at four or five posts' distance, when the first machine is removed, taken a like distance in advance, and the operation repeated. The bells are so constructed that they receive but one stroke on each communication; but they are made to vibrate in such manner that the sound continues a considerable time. There is one wire solely for the purpose of sounding the bells to prevent confusion, and particularly to give effect to the employment of an "accident bell" at every station. This is a large bell, which gives a loud deep tone, and, should an accident happen on any part of the line, the attendant at the nearest station immediately, by a lever, completes the attached electric connection, when the "accident bell" is tolled at every station, and he then immediately proceeds to inform them of its nature and locality. The bell springs require only winding up every fortnight.

Each station is provided with a deflecting lever, by which the attendant can isolate his station when necessary, but without stopping the connection with the bell through the means before stated; and ingenious measures are adopted for carrying off atmospheric electricity, whether intense or of small power, without, in the least, obstructing the artificial current.

The diagram to represent the internal arrangements, will be found at page 18, and in the frontispiece will be seen the front elevation of the telegraphic instrument.

The method of adopting the above admirable aud simply-arranged system of alphabetical and digital signs is as follows. It will be seen that the letters of the alphabet are distributed into two vertical columns on the dial, the first or left-hand column comprising the letters from A to M; the second or right-hand column the letters from N to Z. Between A and N, the first letters of their respective columns, the figure 1 is placed, the meaning of which is, that one motion of the indicator, from its angular position to a vertical one, will signify A or N. If it be the left-hand indicator that moves once, the first letter on the left-hand column is meant—that is A. On the contrary, if it be the right-hand indicator that moves once, the first letter in the right-hand column—that is N—is signified. In like manner, between B, the second letter of the left-hand column of letters, and O, the second letter in the right-hand column of letters, 2 is inserted, which means, that to indicate B, there must be two motions of the left-hand indicator; and to indicate O, there must be two motions of the right-hand indicator; and so for the letters C and D, and P and Qu (u being always joined with Q) respectively, there must be three and four motions of the indicator. A different arrangement has been adopted from the letter E, in one column, and the corresponding letter R, in the other column, downwards. From these letters downwards, the figures, like the letters, are distributed into two columns. Opposite to E, stands the figure 1, and opposite to R, stands the figure 1 also. If the letter to be transmitted be E, *one* single, distinct, motion of the left-hand indicator (E being in the left-hand column of letters) must be *first* made, and the right-hand indicator must then be made to move *once*, by reason of its having figure 1 on the right-hand column, on the same line with letter E. If, on the contrary, the letter R is to be transmitted, one motion of the right-hand indicator (R being in the right-hand column of letters) is to be *first* made, and then one by the left-hand indicator. Thus, instead of five motions of the left-hand indicator being required to indicate the letter E, but two are required, care being taken that the *first* motion is made by the left-hand indicator, and the second by the right-hand indicator. The remaining letters are indicated in a similar way. To spell the word NO, then, by this invention, we have merely to move the right-hand indicator once—that means N. Again, move the same indicator twice; twice it assumes the vertical position, and you have the letter O. NO.

It must be understood that these indicators are not magnetic—they hang on a centre entirely independent of the current; the motion of the handle bringing up a T-shaped lever, which, on either right or left-hand indicator being raised, completes the circuit; but, when the pressure is removed, falls by its own gravity into its original position, similar to the dead escapement of a watch, and thus all vibration is prevented—one of the great evils of all the systems hitherto adopted. As a general mode of working on this system, the patentees, by employing three wires, would have occasion for one battery in London, even for a distance from London to York and back; but they prefer only one working wire, and a battery and earth plate at each station, as by this means any two stations can be conversing together in different parts of the line at the same time, which could not be the case by the other plan.

We shall now conclude, with a concise description of the very elegant and substantial arrangements made by Messrs. **Brett** and **Little**, for the exhibition of this apparatus. The whole is contained in three rooms on the first floor. In the first you are shown the batteries of different constructions, the series working the telegraph, consisting of seventy-two pairs of plates; in the second, you see two very beautiful models of dials, one at each end of a table, representing two stations: and here the internal mechanism is fully shown and described, with the very beautiful bell action, &c.; the third room is, however, the *sanctum sanctorum:* here are seventeen instruments ranged round two sides of the room, representing seventeen stations; between the windows is a magnificent electric clock, set in motion by a small independent battery in the adjoining room; and underneath the dials are ten coils of insulated copper wire, representing 1000 miles of the large wire on railways, and in a straight line. To explain this we would remark, that it is a well founded axiom in electric science, that the current is rapid in proportion to the thickness and uninterrupted position of the wire; and that through a coil of 2500 yards of the finest copper wire made (No. 35) insulated and tightly wound in a coil, the electric fluid has the same difficulty, and takes the same time, in passing, as over 100 miles of wire, perhaps one-eight of an inch in diameter, and 100 miles in length, not coiled, but perfectly unobstructed—hence, the ten coils are equal to 1000 miles; and through these the current passes before it reaches the dials. In this room the whole beauty and simplicity of the system is seen —the isolating one, four, or more stations; or conversing from No. 1 with Nos. 10, 17, and so on; or giving any general notice to all at once—the difference of the intensity of the action, when the fluid is allowed to pass through one, two, or five of the coils, as compared with the whole ten, it then becoming feeble. In one corner is fitted up the before-described accident bell—the action and importance of which is clearly shown. The whole is a highly interesting and intellectual exhibition, powerfully conveying to the mind a clear perception of the advanced state of science in the present day; the beautiful finish of the mechanism giving ocular demonstration of the proud position of the mechanical arts in this country; and the whole reflecting the highest credit on the inventors and patentees.

August 28.

In last week's *Mining Journal* we gave an extended notice of this highly effective, yet simple, application of galvanic electricity to telegraphic purposes on railways; and the patentees have suggested its use for the prevention of accidents in mines and collieries, or for giving notice when they so happen, and obtaining immediate assistance. The idea is exceedingly good, and we know of no purpose to which the principle could be applied with greater advantage. A powerful toned bell or bells, placed at surface, in connection with a galvanic apparatus of moderate power, so arranged, that the men in every level, shaft, &c., could complete the circuit, would give immediate intelligence of any mishap, either from explosion, falls of roofs, sudden iruptions of water, foul air, or any other of the numerous accidents to which miners are subject. There would, we should think, be no occasion for the instruments as constructed by railways; as by the employment of three or four bells of different tones, a set of audible signals might be arranged, which could be understood by the engine-man, or any of the workmen employed at the surface, and which would be quite sufficient for the conveyance of any intelligence from under ground which might be required. An apparatus of this description might be fitted up exceedingly economical, as in no case would there be any very great length of wire, as compared with railways; the posts for supporting them would be dispensed with, as the isolating caps might be affixed to the walls of the levels and shafts, and the whole might be made without any regard to elegance of form—strength being the principal consideration. To men employed from 100 to 200 fms. in the earth, and in some mines even more, such a method would give confidence and consolation, as knowing they could make themselves instantaneously understood to their brethren on *terra firmâ*, and we have no doubt that many mining operations would be simplified and economised by the employment of electro-telegraphs. The attention of the patentees has been long turned to the subject, although they have hitherto been prevented arranging any system, their time having been wholly employed in bringing their telegraph to its present state of perfection. Having been so highly successful in this, we have no doubt they would be equally so with any arrangement applicable to mining purposes ; and when they have more effectually turned their experience in galvanic electricity to such purpose, we shall lay before our readers a full description of their plans.

From the London Mercury, *August* 14, 1847.

Archimedes would have upheaved the globe could he have found a resting-place for his lever ; and science in our own age justifies the memorable exclamation of a profound electrician, " Give me," cried he, " but an unlimited length of wire, with a small battery, and I will girdle the universe with a sentence in a few moments." To afford a popular explanation of the wonder-working engine, constituting direct proof of the subjection of the mightiest powers of matter to the dominion of mind—to render intelligible in few words the machinery of the electric telegraph, is a task of curious difficulty. We can only indicate the principle, and then state the improvements in the practical developement and employment of an ascertained natural law, so far as the ingenuity and scientific adaptation of the patentees, Messrs. **Brett** and **Little**, of Furnival's-inn, have enabled them to reach in advance over the more imperfect and earlier contrivances.

The electric telegraph depends for its action upon the formation and completion of a galvanic circle. What the galvanic or electric fluids may essentially be, whether identical or modifications of each other, is beyond human comprehension. Inappreciable by the senses, we recognise its presence by its powers and effects. If a piece of silver be placed upon the tongue, and a similar piece of zinc be placed under the tongue, and if then the two wetted bits of metal be brought into contact, a galvanic circle is said to be formed ; no appreciable result is produced until contact is effected, and then a slight electrical shock is obvious. In all these experiments two different metals are requisite. On a larger scale the phenomena are more magnificent. We are presented with a final law, and scientific reasoners have invented the theory of a supposed fluid permeating all bodies apparently capable of transmission, according to recognised preferences, passing readily along certain forms of matter, which for that reason are styled " conductors," refusing to pass along others, for similar reason termed "non-conductors." Now, soft iron is easily rendered magnetic, and the magnetised needle is readily made to deflect from its due polarity, either east or west, by different applications of a generated galvanic current. This, then, is the germ of the invention, the secret which has been seized and applied to the alphabet. To furnish the requisite stream, a battery is formed, consisting of a trough of wood, divided into twenty-four cells ; these are filled with fine silver-sand, well moistened with dilute sulphuric acid. The walls of each cell form twenty-four double plates, consisting alternately of zinc and copper throughout the whole series. Now, as far as the telegraph is concerned, if a copper wire passing out from the zinc pole or extreme plate at one end of the trough be brought in contact with a freely suspended magnet, it will cause it to deflect westward. If from the other end or copper pole, it will cause it to deflect eastward, or it is said the current is reversed. And the same results would as instantaneously occur if the wire were either one yard long or one thousand miles distant from the trough in a continuous line. Making a signal, then, is in fact subjecting a freely suspended magnet to the action of what is termed the positive or of the negative wire of a galvanic battery. If the wire were 50,000 miles long, and there were 50 needles on it, each and every one would obey the impulse at the same moment. Well, then, there may be two needles on a dial-plate. To make one of them deflect twice to the left may signify A, thrice B, and so on, the other needle for parallel and simultaneous signs and movements.

Now every one knows that thunder and lightning are the results of what is denominated electrical action; and there are many circumstances which, judging from identity of result, seem to justify the supposition that what is called the electric fluid in spontaneous operation among the clouds, or tearing up forests, and instantaneously destroying human life, is precisely the same mysterious invisible agent as is generated out of pieces of curiously-placed zinc and copper from the action of a weak acid. At all events, it is certain that the apparatus of the Electric Telegraph Company is open to serious disturbamce from the action of the atmosphere during thunder storms, and in other anomalous conditions of the air, whether prevailing locally or generally. The bells are apt to ring violently, the needles to tremble violently, and show no disposition to rest, scarcely obeying under such circumstances the impulse of the operator, and giving out uncertain signals. This has arisen partly from the imperfect character of the "insulators" on each post along the line. There, the wire is made to thread a thimble or slot of pottery affixed to the post; and it is obvious that if no due precaution be taken against the wires becoming wetted at at the point of contact with the post, which, by the same thunder-shower, is wetted too, bye-ways of escape for the galvanic current to the earth are accidentally and unintentionally allowed to exist, as well as of communication from the earth along the line. To obviate this, Messrs. Brett and Little have invented an ingenious contrivance, of thick strong glass, in form not very unlike a church-bell or inverted tulip, only that the side is straight, instead of having a curled and thin lip. This is placed mouth downwards upon a curved style, or iron bracket nailed to the post. The connection between the glass and iron is made in the upper and inner part of the bell by a suitable cement. Then, through what may be described as the shank of the bell, or its upper and outer crown, the wire is threaded. By this contrivance, however wet the wire may become, it is impossible the moisture can be the medium of its communication with the ground; the wet falling on the glass, drips off from its lower edge, and cannot even render damp the interior, much less communicate with the iron supporter. We think this a most admirable and ingenious contrivance, and there is every reason why it ought instantly to replace along every line the imperfect bit of stoneware used as the needle-eye of the suspension posts. Another beautiful contrivance of the patentees is directed to substitute a distinctly pronounced blow upon the bell for the uncertain quivering prolonged thrill characterising the ordinary action. This is effected by the revolution of a disc in corresponding time with the motion of the handle of the bell-hammer. In the disc a notch is cut, and though often, from atmospheric electricity (under present arrangements), the bells are set ringing, by this contrivance it would be no continuous jar or thrilling jingle, but a set of distinct isolated sounds, easily recognisable as to their character and origin. In fact, one of the greatest difficulties with which the inventors of the telegraph have had to contend, has arisen from the varieties in the condition of the atmosphere as respects its electric character. Lightning will pass along the wires into the instruments, and do more serious mischief than rendering the motions of the needles unintelligible.

The electric current is also susceptible of passing upwards from the earth along the wires, and the contrivance for tightening them appended to every fifth post is no desirable appendage even in this view of the matter; it is well, therefore, that the patentees have invented a portable contrivance which entirely supersedes the necessity of the old machinery for that purpose. With the new key a mechanician may tighten twenty miles of wire in a day. The ordinary lightning conductor is placed between the wires as they are carried into the room where the instruments are fixed. Now, galvanic electricity, that is, such as is generated artificially, is said to possess low tension : if contact be complete, it may be easily led; far otherwise if there be the slightest break in the continuity. Atmospheric electricity, on the other hand, is of high tension. It will dart from point to point; will leap a vacuity to the next landing-place; and seems eager to reach the earth, and so restore the natural equilibrium. The patentees have invented a lightning-conductor, constructed on the appreciation of these principles. If the convex surfaces of two minute brass cups be brought within a quarter of an inch in contact, the galvanic current will not leave its wire connected with the upper cup to escape to the lower cup, and then to another wire connected with that cup and leading to the earth: but atmospheric electricity will. And to aid its escape in this harmless direction, a number of metallic points are placed almost in contact with a polished surface of two square inches of metal. In the generation, too, of the requisite current, Messrs. BRETT and LITTLE have made some important improvements in the construction of the troughs. The formation of an oxydised surface, and the deposition of crystals of sulphate of zinc, tended much to impair the efficiency of the apparatus. This has been obviated by filling the troughs with fine siliceous sand as a mechanical absorbent for the acid which is allowed to drip upon it from nipple-like appendages above, while below similarly-constructed contrivances filled with sponge permit the saturated sand just as equally and rapidly to yield the acid by transudation. In this way the formation and deposition of oxide and sulphate of zinc are prevented; clean acid is always presented to a clean surface. This is an important improvement. The face of Messrs. BRETT and LITTLE's dial presents new simplified features. The Electric Telegraph Company use arbitraries, such as would be used in short-hand. This contrivance does not, but every letter of the English alphabet is given. Two indicators are used, but there is only one handle. With the Electric Telegraph Company, their indicator is a magnet, so that all the vibration that can be produced by any imperfection is seen upon it, and it may lead to confusion and error; but the indicators of the patentees affords no mark of vibration: that is already provided for, and has been checked by contrivances which compel their magnet instantly to fall into its place, and leave the indicator to tell its own unwavering story. We saw seventeen instruments all attached, and admired the simplicity of the dial-plate and the low amount of power which was far more than sufficient for them. The current in force from the seventy-two pairs of plates, comprising three troughs in an adjoining room, traverses ten connected coils of wire equal to 1,000 miles. To work only forty miles of telegraph, the Electric Telegraph Company are employing half the power which the patentees use for that enormous distance. Then, too, for every station, there is required a bell and perfect magnet, at a cost of eight guineas, and no contrivance has yet been adopted to insulate the bells, excepting that adopted by these gentlemen. It is rather too much that every bell along the line should ring when attention is demanded only in one place, but this difficulty the patentees appear to have entirely obviated; every bell must ring in the first instance, but this only to call attention. Messrs. BRETT and LITTLE's instruments work at such a slight expenditure of power, that the same battery will serve both for the bell and the telegraph, thereby dispensing with the cost of a magnetic battery to ring the bell, as is the case with the Electric Telegraph Company, who are compelled also to employ another and separate galvanic battery for the purpose of signals. With the present patentees, one galvanic battery serves the double purpose, and they have adopted arrangements whereby any two stations on the same line can converse simultaneously. Thus, for instance, on the North-Western line, their arrangements will enable London and Birmingham to be talking about the funds, while Crewe and Liverpool, on the same line of wire, or Crewe and Manchester, are asking questions about the price of corn or the result of an election. By another peculiar arrangement, one efficient battery of moderate power is sufficient for the line, however extensive; and this is managed by carrying the poles of the battery continuously and completely from end to end, thus avoiding the necessity and cost of a battery at every station.

It requires no extraordinary sagacity or power of mind to appreciate the importance of these valuable improvements and inventions, which reflect upon the patentees the highest credit, and will, doubtlessly, be associated with their due and fitting reward.

August 21.

One of the most important features of Messrs. Brett and Little's inventions is the Railway Accident Bell. Of course the first object of all telegraphic communication is the instantaneous rapidity of its action; and this is essential in no instance more strongly than in the event of an accident. By merely changing the deflector from one wire to another, an accident-bell ringing loudly may be put on at every station, giving notice to stop all passing conversation until it is ascertained on what spot along the line the accident has occurred, and warning departing and arriving trains to proceed with increased caution. In order to effect this most desirable end, all that is necessary is that the guard should carry with him a little portable contrivance enabling him to derive a minute yet sufficient quantity of the electric fluid from the earth. He leaves his seat and places in the earth one end of a wire attached to this little instrument; the other end he connects with the wire running along the line from post to post. Presently all the alarm-bells at every station are set ringing; the alarm apparatus has then done its office, and the ordinary machinery as rapidly suspends its operation, in order to inquire where and what is the accident. During the past week the inventions and improvements of Messrs. Brett and Little have attracted much attention in the scientific and mercantile world. The establishment where their ingenious contrivances are in full operation has been thronged by gentlemen of the highest distinction in every department of mechanical celebrity, engineering talent, and learned profundity. Ladies, too, manifest much interest in the elegant and curious mechanism, and show full sympathy with its objects.

From the JOHN BULL, *August* 21.

We have had the pleasure of inspecting a new electric telegraph, the invention of Messrs. BRETT and LITTLE, of Furnival's Inn, which is, most assuredly, a great improvement on those now in use. The principal features in this invention are the obtainment of a more equable and powerful current of the electric fluid, and a greater certainty in the communications made, by means of a new dial and indicator. A description of these improvements would take up too great a portion of our space, and at best, would be extremely unsatisfactory, without the aid of diagrams. The telegraph can be seen by any one applying for tickets. We are firmly convinced that Messrs. BRETT and LITTLE's invention will soon supersede the machinery now in use for electric communication.

From the BUILDER, *August* 21.

The telegraphic system of Messrs. **BRETT** and **LITTLE**, of Furnival's-inn, is an elaborate result of years of studious ingenuity. The first improvement to be noticed is one for the equalisation and sustainment of galvanic power in its continued application to the main apparatus of the electric telegraph. In this case the old evils resulting from the incrustation of the battery-plates with sulphate of zinc are overcome by the establishment of a steady and continuous system of percolation through the main trough, which is supplied with a bare sufficiency of dilute acid to keep the sand in a state of saturation. This supply is sustained from a trough above, through nipples which allow it to drop down gradually between each pair of plates, while the diffusion of sulphate, as it is formed, sinks, by its own gravity, to the bottom of the main trough, and escapes through somewhat similar orifices filled with sponge, into a trough below.

The next improvement is one for the more complete isolation of the power thus generated, during its course along the telegraphic wires, where it has hitherto been liable to dissipation by moisture, such as rain conducting it into the earth along the usual isolators. This has been obviated by the use of isolators of solid crystal, prolonged below into an inverted cup-like form, from the rim of which all rain must drop or run, without taking its course up again through the interior to the support of the isolator at the top of the cupola, through which alone it *could* complete the conduction to the ground.

The advantages of thus from the outset economising the power wherewith the telegraphic apparatus is to be worked, are various. No separate electro-magnetic apparatus, for instance, is necessary at every station, at a cost of 8*l.* each or so, for connection with the bell; the power itself, eliminated, it may be, and indeed it virtually was, at a distance of 1,000 miles *of wire*, being capable itself of acting directly on the bell mechanism through a delicate little magnet mounted on an axis, with its poles both pointing to the ground; and not only capable of doing so at one, two, or at the utmost, five or six stations, but at many—seventeen on our own observation, represented by seventeen distinct repetitions of the apparatus from which the battery was divided by the 1,000 miles of wire, the additional resistance of which whilst twisted into coil must be also overcome.

There are two indicators, which indicate the alphabetical characters by the number of pendulations, or rather semi-pendulations, of either, or both, towards the perpendicular, according to an arbitrary but simple arrangement engraved on the front of the instrument. Numbers are also engraved in a similar way, and responses such as "understand," "repeat," "yes," "no," &c.

Perhaps one of the most interesting advances in the general principle of the electric telegraph towards ultimate perfection yet attained consists in the capability of conversing by Messrs. **BRETT** and **LITTLE**'s telegraph on a dozen different subjects at one and the same time, on one and the same line of telegraph extending only between twice that number of stations,—and that through one line of wire alone, exclusive of a link of a line for preliminary warning by bell. Earth plates are provided at each station, so that when desired the circuit may be completed through the earth between any two, or every two stations, and the communications of any two of these coupled stations be thus temporarily shut off from all beyond them, while these may all be also otherwise engaged. Thus in a line established between London and Liverpool and Manchester, *viâ* Birmingham, intelligence may be communicated from London to Birmingham without interfering with either Liverpool or Manchester. And, moreover, those stations *between* any two such points of converse may shut themselves off from any temporary intercourse in which they may not be interested until the warning bell announce the contrary.

It would far exceed our present limits were we to particularise the details, by means of which other advantages have been obtained, such as the obviating of the annoyance, confusion, and damage arising from the ringing of bells by atmospheric electricity, and the withdrawal through graduating conductors of all atmospherical electricity, weak or strong, that would otherwise interfere with the action of the wires. We cannot conclude, however, without observing, that although we conceive even this invention to be still far from the *beau ideal* of electro-telegraphic perfection, *that* may be a consummation destined never to be anything else than *ideal*, while there certainly now appears to be a prospect of a speedy realisation of something like practical benefits to the public in general and the railway system in particular, which latter it is full time that this foster-child, so long and so deeply indebted to its parent, should bethink itself of now repaying.

From the ATHENÆUM, *August* 21.

We have visited an exhibition of the improvements effected by Messrs. Brett and Little, of Furnival's Inn, in the construction and working of that marvel of modern science, the electric telegraph:—and will borrow a description of the same for the information of our scientific readers:—The inventions of Messrs. Brett and Little aim at increasing the efficiency of the electric telegraph, in the first place by generating and economising a more constant and powerful electric current; and secondly, by a new arrangement of the dial and indicator, insuring that communications may be made more safely and certainly than by the system now in use. The increased power is attained by a process which frees the copper and zinc plates in the batteries from the sulphate of zinc which ordinarily accumulates upon them, and which soon diminishes their force. Messrs. Brett and Little's apparatus consists of three troughs, placed one above another. The highest is a reservoir containing the exciting power, a diluted sulphuric acid; the middle trough is the galvanic battery, containing the copper and zinc plates, divided by cells or compartments of fine sand; and the lowest trough receives the vitiated liquid, which having slowly dropped from the reservoir into the battery, has filtered through the sand in the latter, and thence percolates drop by drop into the receiving trough below. The diluted sulphuric acid drops from the reservoir into the galvanic battery through small cones perforated at the bottom,—and is carried from the bottom of the galvanic trough by corresponding cones and perforators into the receiving trough. The sand which surrounds the metallic plates is thus constantly saturated; and, as a constant supply of fresh acid is kept up, and the vitiated fluid as constantly escapes below, the formation of crystals of the sulphate of zinc is prevented by this self-cleansing process, and the whole surface of the plates is exposed to the action of the acid. The fluid in the receiving trough is found to contain large quantities of the sulphate of zinc, which would in the ordinary mode have adhered to the plates and prevented the action of the acid upon the metal. The second feature in the invention of Messrs. Brett and Little is the new alphabet, and the altered face of the dial adopted by them. The indicators attached to the dials hitherto in use are generally magnets; and their incessant vibration through electrical and other disturbing atmospheric causes has produced much uncertainty and confusion in communications. The indicators in the dial before us are not magnets, and show no vibration whatever. Another point of difference is that in the dial of Messrs. Brett and Little every letter in the alphabet is given, with the means of expressing it,—so that no symbols or arbitraries need be used, and a sentence may be perfectly and entirely spelled, and transmitted as it is written. In one of their rooms the patentees have seventeen instruments fitted up to represent seventeen stations; and the electric current passes through coils of wire, to each of these instruments, equal to 1,000 miles in length.

There are other devices and improvements in the same exhibition—such as a new and ingenious bell-apparatus, lightning conductors, and insulator. The whole is well worthy the attention of scientific men.

From the PATENT JOURNAL, *August* 21.

The task imposed on the editor of a public journal, to view and report on new inventions, at all times a pleasing one, was never more agreeably undertaken by us than in the present instance, when it becomes our duty to speak of the inventions of Messrs. BRETT and LITTLE, in the electric telegraph. We lately paid a visit to the patentees at their offices in Furnival's Inn, Holborn, aad were by them ushered into a large room, in which were seventeen telegraphic instruments in working order. The first striking peculiarity in this invention is the simplicity of the symbols used on the dial-plate. The telegraph case is made of rosewood, in the Ionic order, and immediately under the pediment is the dial-plate, with two columns of letters for the alphabet, and two columns of numerals from 1 to 25; the two indicators when at rest being at angles of 60 degrees, or thereabout. On passing a current of electricity through the arrangements of the instrument (detailed at length in another page), and on moving a small ivory handle at the front of the instrument, the indicators on the left side moved suddenly, but without vibration, towards the right, assuming a position nearly vertical. This motion indicates the letter A, and on releasing the handle the indicator returned to its angular position. By moving the handle to the right, twice, the indicator moved in the same direction twice, which indicates B. The use of letters and figures arranged as on the dial-plate, will enable any person of ordinary capacity to converse by this instrument correctly, with a very few minutes' study on the subject. The grand improvement consists in having a partially-magnetised ring, moving on centres, and parallel to the planes of fine wire coiled on a flat ivory reel, and striking against two indicators, which are entirely detached from the magnetic arrangement, by which means derangement of action from lightning will be avoided.

Altogether we were very much pleased with these improvements in the telegraph, which certainly merit the careful consideration of all interested in railway telegraphs. By referring to the specification given in our journal, it will be found that Messrs. BRETT and LITTLE have improvements in the battery, and in electric clocks; but as our readers will have ample opportunity to become acquainted with this important invention through the medium of our columns, aided also by the permission readily accorded by the patentees, of viewing the apparatus, it will be unnecessary for us to enter more largely on the subject. Undoubtedly this new system will soon be in operation on a line of railway, not the least of its advantages being *economy*, a matter seldom overlooked by railway directors.

From the ILLUSTRATED LONDON NEWS, *August* 28.

The invention of the electric telegraph, almost contemporaneously with the railway, is one of the most striking facts in the history of modern science. It would appear almost as if ordained to complete the efficiency of that vast system of communication, which, Briareus-like, is stretching its thousand arms over the civilised world. Thus far the importance of the electric telegraph as part and parcel of the railway system; besides which, its agency promises to be extended to the transmission of "the human thought and human will," and thus to become an every-day medium of intercourse.

Hence, the perfecting of the electric telegraph is an object of paramount importance; and every advance to it becomes extremely interesting. Messrs. Brett and Little have just made several successful moves in this direction, in their "Patent Electro Telegraphic Converser," now to be seen at their chambers, in Furnival's Inn. The inventors claim ten improvements; but, as it would occupy considerable space to detail all these, we shall describe only the most striking.

First, is an improved means of generating and economising a more constant and powerful electric current. This increased power is obtained by their "Hydraulic Battery," in which the acid to the sand, or other retainer of moisture, is supplied from above drop by drop, and escapes from below, drop by drop, so as thereby to keep up continuously a percolation through the sand, carry off the sulphate of zinc, and prevent its becoming crystalised on the plate, and thus diminishing the force of the battery. The apparatus, (vide page 14) consists of three troughs, placed one above another. The highest is a reservoir of the exciting power, diluted with sulphuric acid; in the trough beneath is the galvanic battery, containing the copper and zinc plates, divided by compartments of fine sand, and the lowest trough receives the vitiated liquid from the battery. In each case the transmission is through small perforated cones. By this means, the sand which surrounds the metallic plates is kept saturated; and as a constant supply of acid is kept up from above, and the vitiated fluid as constantly escapes below, the formation of crystals is prevented by this *self-cleansing* process, and the whole surface of the plates is exposed to the action of the acid.

The next improvement is a new alphabet, and the altered face of the dial. The indications hitherto employed have been generally magnetic, and their incessant vibration through electrical and other disturbing atmospheric causes, has caused much uncertainty and inconvenience. For these Messrs. Brett and Little have substituted indicators which are not magnetised, and show no vibration whatever. These indicators are worked by a single handle, instead of two. The improved dial-plate has two vertical columns containing numerals from 1 to 25. The centre of the plate is retained for the symbolic arrangement of letters and figures, by which the whole of the letters of the alphabet can be designated. When the indicators are in a state of rest, they are in an angular position; but when put in action they move to a position nearly vertical, but are prevented from passing the vertical line by a pendant bar. In transmitting a signal or signals, the letters of the alphabet are designated by single or repeated motions of either of two indicators (right or left hand), or of both in conjunction. Thus, the letter A, which is placed opposite to figure 1, is indicated by a motion of one left-hand indicator; the letter B, which comes opposite to figure 2, by two motions of the same indicator; the letter E, by two motions; one left and one right; and so on.

Among the other improvements, are an apparatus for conducting the atmospheric electricity to the earth; the more perfect insulation of the long circuit wires; a partially magnetised ring, in combination with a reel or coil of wire whereby the electric current so acts that the motions take place in a direction transverse to the axis of the coil, and parallel, or nearly so to the planes in which the coil of wire lies. There is, likewise, an "accident bell," &c.

Another important improvement is a deflector, in combination with an earth-plate to each instrument, for diverting the electric current, and insulating the instruments, so as to allow them in two or more stations in a long line, to communicate with each other, independently of the other stations.

The patentees show, in one room, seventeen of their instruments, representing as many stations; and the electric current which agitates the indicators in each instrument, traverses a coil of wire equal to 1,000 miles in length.

The series of improvements is an extremely interesting exhibition not only to the man of science, but to every one anxious to comprehend the working of the electric telegraph.

From DOUGLAS JERROLD'S WEEKLY NEWSPAPER, *August* 28.

The importance of the electric telegraph as a means of social communication has already been established. The electric telegraph was first put into extensive operation in the United States of America, and the system adopted was that which is known as the telegraphic alphabet of Professor Morse. Subsequently Messrs. Cooke and Wheatstone took out patents in this country for some valuable improvements adopted by them; and it was only last year that Mr. Highton, of Rugby, obtanied a patent for some additional improvements. Much that was desirable, however, remained to be accomplished.

We had an opportunity of witnessing in operation the improved telegraph of Messrs. Brett and Little, of Furnival's Inn, through seventeen instruments, and coils of wire equal to one thousand miles. The first improvement effected by the patentees has reference to the apparatus for generating the electrical current—the galvanic battery. It is well known that the action of the sulphuric acid on the zinc plates of the battery produces an incrustation, called sulphate of zinc, which considerably impairs its operation, and requires it to be frequently cleaned. This evil is remedied by using three troughs, one placed over the other. The topmost contains the diluted acid, which drops gently through small apertures in the bottom into corresponding apertures in the second trough. In this are contained the metallic layers of zinc and copper, the interstices between which are filled by a fine sand. The advantage of the sand is that it absorbs sufficient moisture from the acid to excite the required action, and no more, the superfluous acid being allowed to percolate through this second trough also by means of apertures filled with sponge, on the principle of the common water filterer, in the last trough which receives the vitiated liquid. The effect of this arrangement is to keep the plates clean, and thereby to render the electric current more equable and powerful. It is also well known that the system used at present is liable to be affected to such a degree by the electric condition of the atmosphere as, all times, to render the telegraph perfectly useless. Where intelligence of an accident is to be transmitted, a strong and striking sound is given out for the purpose of attracting the immediate attention of the attendant to the telegraph. The same battery that is used for ringing the bells is also employed to give action to the telegraph, thus obviating the expense and inconvenience of requiring a separate battery for each purpose. It remains to give a description of the dial plate and its admirably arranged and easily comprehended dial of letters and figures. This plate is about six inches high and ten abroad, and is divided in its height by several compartments. There are two indicators, or hands, which are not magnetic. These are moved by a sort of double headed hammer, in the form of the letter T, which is attached to a magnetised ring on the inside of the telegraph, in the upper periphery of which ring the centre of motion resides. The indicators are reclined, when at rest, at an angle of about 60 degrees; when in action they move to a vertical position, just as we can imagine the hands of a clock or watch being at rest at the hours indicated by 8 and 4, and on motion being imparted to them rising rapidly to the vertical position indicated by the hour of 12. The letters of the alphabet are distributed into two vertical columns on the dial, the first or left hand column comprising the letters from A to M; the second or right hand column the letters from N to Z. Between A and N, the first letters of their respective columns, the figure 1 is placed, the meaning of which is, that one motion of the indicator from its angular position to a vertical one will signify A or N. But which? Nothing more easily determined. If it be the left hand indicator that moves once, the first letter on the left-hand column is meant—on the contrary, if it be the right hand indicator that moves once, the first letter in the right-hand column—that is N is signified. A like arrangement, slightly varied however, deals with the other letters. This, indeed, may be called the alphabetic telegraph, and it is unquestionably more simple than the one in use at present, in which a system of arbitraries must be employed.

But if there be any advantage in using a symbolic system, as there sometimes may where great expedition is required, that advantage is possessed by the telegraph of Messrs. **Brett** and **Little** as effectually as by any other. The patentees have discovered very ingenious contrivances for preventing the escape of the electric current from the wire lines while passing through the posts, by a more perfect means of insulation than has been heretofore adopted, and also for giving the greater tension.

From the ERA, *August* 29.

We live in wondrous times. Who would have thought, even a few years since, that we should have been able to travel with perfect ease and safety at the rate of fifty miles an hour? Who would have thought that the voyage from the old world to the new could be compassed in the short space of twelve days, and that, too, with much greater certainty and regularity than it took within the memory of living man to journey from London to Scotland? Fulton, Watt, and Stephenson may be thanked for the application of this wondrous power; and what steam has done for the speedy communication between human bodies, electricity will effect for the rapid interchange of thought and mind.

When it is borne in mind that electricity travels at the rate of 288,000 miles *in a second*, it is impossible to calculate what the electric telegraph will effect; but this is quite certain, that if it were possible to establish a telegraph between London and Pekin, another at Rome, and another at New York, we should, in less than one minute, be able to communicate with each; and, moreover, have an answer the next.

A Telegraph Company has been established for the practical working out of this wonderful discovery. This company has purchased or made arrangements with the various patentees for the exclusive use of their patents; and as this discovery ought to be attended with considerable profit to those who bring it into practical operation, we very sincerely recommend all those who have patents to unite in one common bond of union for their mutual interests.

We do not know whether our readers have ever seen an electro-telegraph in working; if they have not, we should recommend them to apply to Messrs. **Brett** and **Little**, of Furnival's Inn, where they will see one in operation virtually over a distance of 1,000 miles.

It is not our province to enter into the minute details of the mechanism by which the system of Messrs. **Brett** and **Little** is brought into its present perfect action, but merely to draw general attention to the peculiarities and advantages which it is stated to possess as compared with the various patents which have preceded it.

The battery, which may be termed the motive power, is peculiar and unique. It is more perfect and more powerful than any yet adopted, bringing into play a much larger surface, and avoiding almost entirely the destructive elements to which others are subject from crystallisation of the zinc plates, and consequently ensuring a more regular and constant supply of electricity for telegraphic purposes.

The indicators, which are non-magnetic, are not subject to the vibration, and, consequently, free from the uncertainty in their use, to which those of Messrs. Cooke and Wheatstone are liable.

The alphabetical and digital signs are arranged with admirable simplicity; and, as the indicators, when put in motion, act independently of the current, so they resume their original position without oscillation, and thus establish a more certain mode of communication.

Another important advantage is, that the working of the system may be effected by means of a single battery, and that only two wires are required for intermediate and terminal stations.

An additional feature is for the first time introduced by Messrs. **BRETT** and **LITTLE**, viz., that of adapting the system to a portable apparatus intended to accompany every train, by means of which, in case of accident on a line of railway, the circumstance may be communicated to every station on the line by the guard of the train.

As compared with the system of Messrs. Çooke and Wheatstone, the invention of Messrs. **BRETT** and **LITTLE** is stated to be more simple and more certain in its working, and far less expensive in its construction.

The various purposes to which electricity can be made applicable have yet to be developed, but we have no hesitation in stating that it will lead to consequences of which few can now anticipate the result.

It would extend these pages far beyond any necessary limits, were we to insert the whole of the notices of this invention which have appeared in the provincial press, or to repeat the numerous extracts which have been made from the foregoing observations. Suffice it to say, that out of the 300 or 400 newspapers published in the United Kingdom, there are comparative few in which a notice of some kind of these improvements has not appeared. As, however, the opinions and descriptions given by gentlemen connected with the London papers we have enumerated, are from actual inspection and observation, and with every opportunity afforded for investigating the merits of the system, for raising objections, and for obtaining explanations, we have preferred giving them entire, and